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ABSTRACT

This report presents information on the systemic changes that have occurred and will occur in environmental management technologies curriculum in participating secondary and postsecondary institutions as a result of the installation of tech prep pathways in the Heart of Ohio Tech Prep Consortium. Part I contains the curriculum pathways and pathway narratives for three high schools (Reynoldsburg, Whitehall-Yearling, and New Albany) and for Columbus State Community College. The high school pathways detail the following: courses to be taken in grades 9-12, prerequisites for grade 11 and the college portion of tech prep, suggested electives, explanation of tech prep blocks, and high school and college exit occupations. The college pathway lists required courses for six quarters. Part II lists secondary competencies. They include academic competencies in these areas: communications literacy, mathematics, science literacy, computer literacy, and employability skills. Secondary/technical competencies are listed under these areas: environmental management/resource conservation; biological surveying and monitoring; ecological principles; environmental politics, laws, and economics; and cartography. Each area is divided into subareas under which the skills are listed. (YLB)

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ED 413 418

## HEART of OHIO TECH PREP CONSORTIUM

# ENVIRONMENTAL MANAGEMENT TECHNOLOGIES

Curriculum Pathways, Pathway Narratives, Competency Documentation Sheets, and Program Application

Approved by Consortium Board of Directors:
May 1997

Heart of Ohio Tech Prep Consortium
Central Office, c/o Columbus State Community College
550 East Spring Street, Columbus OH 43215
614/227-2452

CE 074 822

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# ENVIRONMENTAL MANAGEMENT TECHNOLOGIES

**Heart of Ohio Tech Prep Consortium**

**May 1997**

## PART I:
## SECONDARY AND POSTSECONDARY PATHWAYS AND PATHWAY NARRATIVES

# HIGH SCHOOL CURRICULUM PATHWAYS AND PATHWAY NARRATIVES

Reynoldsburg High School &
Eastland VEPD

Environmental Management Technology

Central Ohio Tech Prep Consortium

September 1995

| 9th Grade | Min | 10th Grade | Min | 11th Grade | Min | 12th Grade | Min |
|---|---|---|---|---|---|---|---|
| Tech or Business Algebra I | | Tech or Business Geometry | | College English III | 48 | Integrated Math IV | 48 |
| American History | | Resource Management | 150 | Integrated Math III | 48 | College English IV | 48 |
| Applied Biology | | Mechanical Science/ | | Enviro Chemistry | 48 | Enviro Geology | 50 |
| Word Processing | 50 | Adv Word Process/Computers | 50 | Tech Prep Lab | 150 | *Tech Prep Lab | 100 |

**PREREQUISITES FOR GRADE 11 OF TECH PREP:**
Demonstrated potential for college preparation coursework as measured by standardized achievement test:

- No academic deficiencies
- Successful completion of Alg I

**PREREQUISITES FOR COLLEGE PORTION OF TECH PREP:**
Enrollment in 9th and 10th grade Tech Prep academic course work or college preparatory course work. Articulation or proficiency testing will determine where students place into the program.

**SUGGESTED ELECTIVES:**
Foreign Language (Grades 9 & 10)
Computer Literacy (Grades 9 & 10)
Biology I

**EXPLANATION OF TECH PREP BLOCKS:**
**9th Grade:** Students are in a 200-minute block of core curriculum.
**10th Grade:** Students are in a 150-minute block of core curriculum.
**11th Grade:** Tech Prep science (chemistry) and occupational competencies taught in 198 minute block.
**12th Grade:** Tech Prep Science (Geology) and occupational competencies taught in 150 minute block.
***12th Grade:** Occupational competencies developed through participation in school-based learning; worksite-based internships, mentorships; and/or enrollment in post-secondary options.

**HIGH SCHOOL EXIT OCCUPATIONS:**
Wastewater Treatment Plant Operator, Environmental Lab Technician, Water Treatment Plant Operator, Natural Resources Aide, Pollution Control Technician

**COLLEGE EXIT OCCUPATIONS:**
Hazardous Waste Technician, Emergency Response Technician, Environmental Technician, Research Technician, Air Sampling and Monitoring Technician

**Central Ohio Tech Prep Consortium**
**Curriculum Pathway Narrative**
Reynoldsburg High School
April 1996

Directions: Please complete this document to accompany the curriculum pathways

*In the space below, briefly describe the systemic change at the secondary level and what new options are now available for Tech Prep high school students (occupational, employability, and academic).*

Systematic change at Reynoldsburg High School is reflected in the integration of personal development and resource management classes, mentorship, and core curriculum classes in a team setting.

Change is also reflected in the eleventh and twelfth grade plan in which students will have the option of attending the high school Tech Prep program of their choice for one-half or full-day, attending the career center for the occupational portion of the program.

In the ninth grade, the Reynoldsburg High School Tech Prep plan combines six subjects (math, science, American history, communications, word processing, applications, and personal development) taught by a team of six teachers. The four core subjects will be delivered in a 200-minute block in the morning. Word Processing Applications and Personal Development, which are normal semester classes, will be offered in the afternoon following lunch on an alternating-day basis determined by which group the student is in — purple or gold. For example, period six purple would go to Word Processing Applications on Monday while period six gold would go to Personal Development. On Tuesday, the groups would switch classes, etc. All students receive 5 1/4 credits that include one math, one communications, one science, one American history, one-half word processing elective, and 3/4 personal development elective. Through the Personal Development class, students will have the opportunity to do job shadowing. The students also have two periods for electives or other freshman required courses in the afternoon. Projects will be introduced approximately once a month and will be "led by one of the six team subjects. Each project will integrate from two to all six classes. One hundred eight ninth-grade students have selected the Tech Prep plan.

In the tenth-grade year, students have an opportunity to continue their Tech Prep studies in a 100-150-minute morning block of classes taught by a team of teachers. These classes include communications for one credit, math for one credit, computer applications for one-half credit, and resource management for 3/4 credit and are job focused. Again, computer applications and resource management meet on an alternating day basis. In the resource management class, students will study the process of finding a job, go through mock interviews, and will study how to budget their resources to enhance their personal life. Following lunch, students have the opportunity to take up to four electives or other sophomore required classes. Thematic projects will be introduced once every nine weeks.



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*Central Ohio Tech Prep Consortium*

September 1995

| 9th Grade | Min | 10th Grade | Min | 11th Grade | Min | 12th Grade | Min |
|---|---|---|---|---|---|---|---|
| Tech or Business Algebra I | | Tech or Business Geometry | | College English III | 48 | Integrated Math IV | 48 |
| American History | 200 | Resource Management | 150 | Integrated Math III | 48 | College English IV | 48 |
| Personal Development | 50 | Tech Biology | | Enviro Chemistry | 48 | Enviro Geology | 50 |
| Word Processing | 50 | Adv Word Process/Computers | 50 | Tech Prep Lab | 150 | *Tech Prep Lab | 100 |

**PREREQUISITES FOR GRADE 11 OF TECH PREP:**
Demonstrated potential for college preparatory coursework as measured by standardized achievement test:

- No academic deficiencies
- Successful completion of Alg I

**PREREQUISITES FOR COLLEGE PORTION OF TECH PREP:**
Enrollment in 9th and 10th grade Tech Prep academic course work or college preparatory course work. Articulation or proficiency testing will determine where students place into the program.

**SUGGESTED ELECTIVES:**
Foreign Language (Grades 9 & 10)
Computer Literacy (Grades 9 & 10)
Biology I

**EXPLANATION OF TECH PREP BLOCKS:**
**9th Grade:** Students are in a 200-minute block of core curriculum.
**10th Grade:** Students are in a 150-minute block of core curriculum.
**11th Grade:** Tech Prep science (chemistry) and occupational competencies taught in 198-minute block.
**12th Grade:** Tech Prep Science (Geology) and occupational competencies taught in 150-minute block.
***12th Grade:** Occupational competencies developed through participation in school-based learning; worksite-based internships, mentorships; and/or enrollment in postsecondary options.

**HIGH SCHOOL EXIT OCCUPATIONS:**
Wastewater Treatment Plant Operator, Environmental Lab Technician, Water Treatment Plant Operator, Natural Resources Aide, Pollution Control Technician

**COLLEGE EXIT OCCUPATIONS:**
Hazardous Waste Technician, Emergency Response Technician, Environmental Technician, Research Technician, Air Sampling and Monitoring Technician

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**Central Ohio Tech Prep Consortium**
**Curriculum Pathway Narrative**
Whitehall-Yearling High School
April 1996

Directions: Please complete this document to accompany the curriculum pathways.

*In the space below, briefly describe the systemic change at the secondary level and what new options are now available for Tech Prep high school students (occupational, employability, and academic).*

Whitehall-Yearling High School has chosen to create its own model of excellence using The Effective Schools Model as a springboard. A vast majority of our students graduate from the "general track" with no specific employability skills. Therefore, we are initiating Tech Prep, an interdisciplinary, project-oriented approach to learning, which will more effectively prepare graduates to enter the work force, college, or other postsecondary educational opportunities.

The Whitehall-Yearling Plan, during the ninth-grade block, will combine five subjects (communications, math, science, business, and technology) in a four-period time block. The block will be 214 minutes long and will be delivered in the first four periods of the day. Students will travel from the different rooms based on time schedules to be determined by the team of teachers. All students will receive four credits that include: 1 math, 1 communication, 1 science, ½ business, and ½ technology. These students will then have a lunch period, followed by three additional periods for electives or other required courses. During the Tech Prep program, each project will focus on a different academic area. One hundred ninth-grade students have been selected for the Tech Prep team.

The tenth grade block, consisting of communications, science, math, and computer applications, will enable students to continue their Tech Prep studies. That team of teachers will be selected before school is adjourned in June 1994. The tenth grade Tech Prep program will be based on four thematic units. At the junior and senior levels, students will be instructed by vocational instructors at the home school, at the career centers, or on the job. Career clusters and applied academics are currently being developed in engineering and technology. This constitutes our view of a seamless curriculum whereby students will graduate prepared to enter two-year, technical, or four-year postsecondary programs, or the world of work. We feel the Whitehall-Yearling Plan addressed the precepts of the common belief system as follows:

*ALL STUDENTS CAN LEARN:* The Whitehall-Yearling Plan addresses the needs of all students, especially those who learn best in a nontraditional environment. The removal of barriers posed by the traditional, 50 minute academic block will allow students to become more participatory in their learning. Students will see connections between academia and the world of work. Project-based learning will ensure applied academics and hands-on experiences. This plan will also more effectively allow for mainstreaming and inclusion of special needs students. Teachers will be seen and heard making decisions and discussing various strategies to enhance student success.

*LEARNERS POSSESS MULTIPLE INTELLIGENCES:* The Whitehall-Yearling Plan will be built upon the students' individual talents and strengths such as music, photography, speech, etc., to complete unit projects. In addition, a learning styles assessment, known as CAPSOL, will be administered during the summer of 1994, after which teachers can more effectively create classrooms and activities which take into account various learning styles. At the junior/senior levels, students will be able to participate in career clusters which most appropriately match their individual aptitudes and interests. Teachers will be observed using five to seven instructional strategies during a unit of study.

*PARTICIPATION IN A LEARNING COMMUNITY FOSTERS SOCIAL, CIVIC, EMOTIONAL, AND INTELLECTUAL GROWTH:* Teachers working in interdisciplinary teams will help students see the connections between academic disciplines. The use of more hands-on projects, especially the culminating activities, will encourage students to learn to work and problem-solve in teams. Weekly Tech Prep assemblies of students and teachers will be held to increase communication. The Tech Prep team has already begun referring to the success of "our" kids for the next year. Community members, parents, and business partners will be involved in the assessment of those projects. As the students move into the tenth grade Tech Prep program, shadowing experiences, interest inventories, interning, use of the OCIS, review



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of the ICP, and exploration of the career clusters at off-site locations such as Mt. Carmel East Hospital, Columbus State Community College, AT&T, Limited Credit Services, EBCO, and the C. Ray Williams Early Child Development Center.

*DIVERSE INSTRUCTIONAL STRATEGIES AND ENVIRONMENTS:* The school day will certainly be different for the Tech Prep student. Class time will be based on learning needs rather than on the clock. Tech Prep teachers have already been given common planning time as well as an individual planning period. Alternative assessments, such as portfolios, learning logs, and audio-visual projects will be used in conjunction with community assessors and displayed throughout the school. The SCANS report has been utilized to determine competencies needed in modern occupations and will be studied by students in applied classes.

*SUPPORT SYSTEMS:* Whitehall is fortunate to have acquired five computer labs for student use which will be an integral part of The Whitehall-Yearling Plan as the students learn keyboarding, editing, and desktop publishing skills. The Board of Education has allowed the high school to eliminate the general track and has encouraged our pursuit of the Tech Prep initiative. The BRIDGES grant, acquired in 1990, has since been incorporated into the district budget, providing peer-assisted learning tutors. Whitehall is also fortunate to have a broad base of support from local corporations and small businesses, led by its education partner, Limited Credit Services. Within a five-mile radius, lie Mt. Carmel East Hospital, AT&T, EBCO, DCSC, DFAS, and Port Columbus.

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Eastla 'EPD

Environmental Management T· ology
Satellite Program at New Albany High School

Central Ohio Tech Prep Consortium

September 1995

| 9th Grade | Min | 10th Grade | Min | 11th Grade | Min | 12th Grade | Min |
|---|---|---|---|---|---|---|---|
| | | | | College English III | 48 | College English IV | |
| | | | | Enviro Chemistry | 48 | Integrated Math IV | 48 |
| | | | | Integrated Math III | 48 | Enviro Geology | 50 |
| | | | | Tech Prep Lab | 150 | *Tech Prep Lab | 100 |

**PREREQUISITES FOR GRADE 11 OF TECH PREP:**
Demonstrated potential for college preparatory course work as measured by standardized achievement test:

- No academic deficiencies
- Successful completion of Alg I

**PREREQUISITES FOR COLLEGE PORTION OF TECH PREP:**
Enrollment in 9th and 10th grade Tech Prep academic course work or college preparatory course work. Articulation or proficiency testing will determine where students place into the program.

**SUGGESTED ELECTIVES:**
Foreign Language (Grades 9 & 10)
Computer Literacy (Grades 9 & 10)
Biology I

**'EXPLANATION OF TECH PREP BLOCKS:**
**11th Grade:** Tech Prep science (chemistry) and occupational competencies taught in 198-minute block.
**12th Grade:** Tech Prep Science (Geology) and occupational competencies taught in 150-minute block.
***12th Grade:** Occupational competencies developed through participation in school-based learning; worksite-based internships, mentorships; and/or enrollment in postsecondary options.
Employability skills are taught within the technology lab.

**HIGH SCHOOL EXIT OCCUPATIONS:**
Wastewater Treatment Plant Operator, Environmental Lab Technician, Water Treatment Plant Operator, Natural Resources Aide, Pollution Control Technician

**COLLEGE EXIT OCCUPATIONS:**
Hazardous Waste Technician, Emergency Response Technician, Environmental Technician, Research Technician, Air Sampling and Monitoring Technician



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**Central Ohio Tech Prep Consortium**
**Curriculum Pathway Narrative**
Eastland Vocational School District

Directions: Please complete this document to accompany the curriculum pathways.

*In the space below, describe system change at the secondary level and what new options are now available for Tech Prep high school students (occupational, employability, and academic).*

Systemic changes are reflected in the satellited Environmental Management Technology program schedule where students have the option of attending New Albany High School for a full day or attending their home school for the academic portion of the program and spending a half day at the New Albany High School for the occupational portion of the program.

The primary focus of the Eastland Environmental Management Technology program is to prepare students for continued study in two-year or four-year colleges after high school graduation. While meeting this goal, the program also prepares the student for an entry-level position in several environmental fields.

Approximately one-half of the day is spent in academic classes. Instructors in chemistry, geology, and algebra, work closely with the program instructor to relate college-preparatory academic course work to the environmental industry. Although course work is not applied, all students are required to enroll in a college preparatory English class for both the junior and senior year of the program.

The other half-day involves textbook and hands-on learning connected to various aspects of the environment. The occupational competencies will be delivered in the 100 - 150-minute Environmental Management lab. Flexible block scheduling allows the Environmental Management Technology; the algebra and science instructors to work with the same group of students. This scheduling provides the flexibility for teachers to develop interdisciplinary units, to team teach, and to adjust periods allowing more instructional time for specific topics.

In addition to daily contact with the Environmental Management Technology instructor, students will receive instruction from other instructors associated with the Environmental Technology program offered at Columbus State Community College. Numerous opportunities will be available for off-site learning experiences at Columbus State, Ohio State and environmentally-related industries in the area. Students also have access to a 50-acre wetlands/woodlands on a daily basis.

During the senior year of the program, occupational competencies are developed through participation in school-based learning; worksite-based internships, mentorships; and/or enrollment in post-secondary options.

# COLLEGE PATHWAY AND NARRATIVE

# ENVIRONMENTAL TECHNOLOGY

**Columbus State Community College**
**Curriculum Pathways, Narratives, and Competency**
**for**
**Heart of Ohio Tech Prep Consortium**

**April 1997**

## High School Exit Occupations:

Wastewater Plant Operator
Environmental Lab Technician
Water Plant Operator
Natural Resources Aid
Pollution Control Technician

## College Exit Occupations:

Air Sampling and Monitoring Technician
Field Sampling Technician
Environmental Technician
Wastewater Analyst
Water Analyst
Soil Analyst
Hazardous Materials Analyst
Chem/Analytical Lab Technician
Biological/Microbiological Lab Technician
Environmental Compliance Technician
Lead-Based Paint Abatement Worker/ Supervisor/Inspector
Asbestos Abatement Worker/Supervisor/Inspector
Decontamination Technician
Emergency Spill Response Technician
Leaking Underground Storage Tank Remover
Haz Mat Technician
Wastewater Plant Operator
Water Plant Operator

## Prerequisites for College Portion of Tech Prep:

No specific prerequisites because articulation or proficiency testing will determine where students will enter the program. However, in order to follow the sequence as closely as possible, students should be computer literate and proficient in beginning algebra. High school level chemistry and biology coursework is recommended, as well.

## Suggested Electives:

Field Co-op Experience, Work Experience Seminar, and Manufacturing Processes.

## Advanced Skills Portion of Tech Prep:

Shaded areas represent the advanced skills portion.

**Environmental Technology, Columbus State Community College**
**April, 1997, Post Secondary Path-The Heart of Ohio Tech Prep Consortium**

| 1st Quarter | Cr | 2nd Quarter | Cr | 3rd Quarter | Cr | 4th Quarter | Cr | 5th Quarter | Cr | 6th Quarter | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Beg. Composition ENGL101 G | 3 | Essay & Research ENGL102 G | 3 | Elementary Chemistry I CHEM111 B | 5 | Elementary Statistics MATH135 B | 5 | Environmental Chemistry ENVR220 T | 3 | Technical Elective XXX T | 2 |
| Technical Math II MATH112 B | 4 | Industrial Pollution Control ENVR110 T | 3 | Basic Surveying SURV141 T | 4 | Environmental Systems Analysis ENVR253 T | 3 | Elementary Hydraulics CIVL221 T | 3 | Subsurface Restoration Techniques ENVR254 T | 5 |
| Environmental Project Coord ENVR101 T | 3 | Introductory Biology I BIO 111 B | 5 | Environmental Aspects of Soil ENVR120 T | 3 | Technical Writing ENGL204 G | 3 | World Economic Geography SSCI104 G | 5 | American Civilization II HUM152 G | 5 |
| Earth Systems I GEOL101 B | 5 | Environmental Laws & Regulations ENVR130 T | 5 | Environmental Science BIO 127 B | 5 | Subsurface Invest. Techniques ENVR250 T | 5 | Air Monitoring ENVR255 T | 4 | Environmental Hydrology ENVR224 T | 3 |
| Environmental Analysis ENVR158 T | 3 | Conference & Group Discussion COMM110 G | 3 | Health & Safety Training/Haz Waste ENVR252 T | 3 | Wastewater Treatment Techniques ENVR223 T | 3 | Environmental Computer Appl ENVR112 T | 3 | Cardiopulmonary Resucitation MULT102 T | 1 |
| Basic Construction Drafting ARCH111 T | 4 | | | | | | | Construction CAD Drafting ARCH112 T | 3 | Responding to Emergencies MULT103 T | 2 |
| | | | | | | | | | | Hazardous Materials Refresher ENVR256 T | 1 |
| | | | | | | | | | | Water Treatment Techniques ENVR222 T | 3 |

**Strikeout text = those courses that students may articulate or pass via proficiency testing**
**Shaded boxes = advanced skills added to the curriculum**

## Explanation of Tech Prep Course Differences:

Struckout courses represent those that students may articulate or pass via proficiency testing. Shaded courses represent the advanced skills protion. The current technical program is represented by 106 credit hours.

# Central Ohio Tech Prep Consortium
# Curriculum Pathway Narrative

## Columbus State Community College Environmental Technology
## April 1997

**In the space below, describe the systemic change at the postsecondary level and what new options will be available for Tech-Prep college students (occupational, employability, and academic).**

Systemic change that will occur in the Environmental Technology at Columbus State, as a result of the installation of Tech Prep pathways in the Heart of Ohio Tech Prep Consortium, include the following:

- Additional breadth and depth competencies will be possible at the post-secondary level as a result of students coming to Columbus State better prepared to do college level work. This will help ensure that business and industry's expectations for qualified Environmental professionals are being met by increasing the time available to learn additional competencies that are being requested by employers in the following areas:

  * Drafting/CAD
  * Experience credit toward Wastewater Treatment Plant Operator's License
  * Experience credit toward Water Treatment Plant Operator's License
  * Current HAZWOPER Certification

- Business and industry are seeking graduates that are broadly educated across disciplines as well as prepared specifically in technical specialties related to their primary field. The Heart of Ohio Consortium approach addresses these needs on a program-by-program articulation basis. This optimizes the ability of graduates to be immediately productive and job ready upon graduation from the Columbus State Community College associate degree program. Graduates from these advanced skills programs should enhance the employers' competitive ability in a period of rapid technological change.

  Articulation agreements between specific VEPD Tech Prep programs and the Columbus State Community College Environmental Technology program will be formalized on an individual basis, as the vocational articulation agreements are currently done. The Tech Prep agreements will be in addition to, not in lieu of, existing vocational program agreements.

- The Environmental Technology program is regularly validated through ongoing business and industry surveys. While the College is confident that the Environmental Technology program currently meets business and industry needs, the faculty and administration of Columbus State acknowledge that some foundational competencies can be delivered within a collaboratively developed secondary curriculum. The development of this Tech Prep curriculum provides students with a unique opportunity to augment a solid associate degree curriculum with valuable courses and educational experiences that are not currently included in the standard degree program. Students will benefit from the additional depth and breadth of the advanced skills associate degree program as well as the elimination of the need for remediation upon entering Columbus State Community College.

# ENVIRONMENTAL MANAGEMENT TECHNOLOGIES
## Heart of Ohio Tech Prep Consortium
## May 1997

# PART II:
# SECONDARY COMPETENCIES

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ACADEMIC COMPETENCIES:

Academic Expectations: All students will be enrolled in the following course sequence:

JUNIOR YEAR — College English III (competencies target preparing students to place into English III at Columbus State Community College)
Integrated Math III (Math 103 and 104)
Environmental Chemistry

SENIOR YEAR — College English IV (competencies target preparing students to place into English III at Columbus State Community College)
Integrated Math IV (Math 104) (competency-based coursework preparing students to place into Math 148)
Environmental Geology


COMMUNICATIONS LITERACY
- Effective Reading Skills . . . 1
- Effective Speaking and Presentation Skills . . . 2
- Effective Writing Skills . . . 3
- Effective Listening Skills . . . 3
- Critical Viewing/Graphic/Observation Skills . . . 4

MATHEMATICS
- Algebra . . . 5
- Geometry . . . 8
- Numbers and Number Relations . . . 9
- Data Analysis and Probability . . . 10
- Technical Algebra . . . 10
- Technical Trigonometry . . . 12

SCIENCE LITERACY
- Organic Chemistry . . . 13
- Geology and Hydrology . . . 24

COMPUTER LITERACY . . . 32

EMPLOYABILITY SKILLS . . . 35

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**COMMUNICATIONS LITERACY**
(Eng 100)

Effective Reading Skills

1.01.01.00 Differentiate between fact, opinion, and inference

1.01.03.00 Recognize the intent and use of propaganda

1.01.04.00 Identify and summarize ideas, information, and events that are explicitly stated in written material

1.01.05.00 Explain the sequence of time, places, events, and ideas

1.01.06.00 Identify and explain the main and subordinate ideas (stated or implied) in a written work

1.01.06.01 Differentiate between details that support or do not support main ideas in a written work

1.01.08.00 Find, understand, and apply information from a variety of sources (books, manuals, newspapers, periodicals, directories, reference works, computer printouts, and electronic sources)

1.01.09.00 Use the features of books and reference materials, such as table of contents, preface, introduction, titles and subtitles, index, glossary, appendix, and bibliography

1.01.10.00 Define and use unfamiliar words and specialized vocabulary (including abbreviations, acronyms, concepts, and jargon) by using structural analysis, decoding, contextual cues, dictionaries, and computers

1.01.11.00 Read and understand short notes, memos, letters, and forms

1.01.12.00 Read and follow complex directions

1.01.13.00 Determine the author's purpose

1.01.14.00 Read, evaluate, and respond critically to various literature forms, genres, and printed medias

1.01.15.00 Recognize and interpret organizational patterns of writing (e.g., cause and effect, comparison and contrast, and simple listing)

1.01.16.00 Identify the structural elements of literature (e.g., plot, theme, character, mood, setting, and point of view)

1.01.17.00 Identify literary devices (e.g., metaphor, foreshadowing, flashback, allusion, satire, and irony)

1.01.19.00 Take accurate notes from written sources

1.01.20.00 Recognize, analyze, and discuss the rhetorical strategies and writing techniques used in

1.01.20.00 Recognize, analyze, and discuss the rhetorical strategies and writing techniques used in various student and professional writings

1.01.21.00 Summarize or paraphrase a written selection to confirm one's own understanding of what was read

1.01.22.00 Understand and use appropriate techniques for taking different types of tests

Effective Speaking and Presentation Skills

1.02.01.00 Give oral directions and clear explanations

1.02.02.00 Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with individuals

1.02.03.00 Demonstrate correct usage of vocabulary

1.02.05.00 Speak effectively using non-verbal communication such as eye contact, posture, and gestures

1.02.06.00 Select topics suitable to audience, situation, and purpose

1.02.08.00 Give formal and informal talks and speeches

1.02.08.01 Explain and demonstrate the basic elements of public speaking

1.02.08.02 Present speeches using an extemporaneous delivery style, with minimal use of note cards or text, maximum eye contact, appropriate voice intonations and body language, and minimal verbal mannerisms

1.02.09.00 Demonstrate the differences between informing and persuading and use the appropriate techniques of content and delivery for each purpose

1.02.09.01 Present an informative speech by limiting the scope of the topic and selecting a workable pattern of organization with an effective beginning and ending

1.02.09.02 Present a persuasive speech that will demonstrate the student's awareness of and sensitivity to the audience through the use of appropriate language and audience data

1.02.10.00 Use visual media

1.02.11.00 Demonstrate proper telephone etiquette

Effective Writing Skills

| | |
|---|---|
| 1.03.01.00 | Demonstrate ability to use different forms of writing (e.g., literary response, business and technical communicative modes, personal responses, journals, research and recording) |
| 1.03.01.01 | Demonstrate understanding of good letter writing principles |
| 1.03.02.00 | Demonstrate appropriate selection of mode, purpose, audience, point of view, and organization of information in written assignments |
| 1.03.02.01 | Produce a completed narrative essay |
| 1.03.02.02 | Produce a completed descriptive/observational essay |
| 1.03.02.03 | Produce a completed informational paper |
| 1.03.02.04 | Produce a completed persuasive essay |
| 1.03.03.00 | Demonstrate proficiency in word processing, graphics, and/or desktop publishing aids for writing |
| 1.03.04.00 | Apply writing process techniques: 1) Prewriting 2) Drafting 3) Revising 4) Editing/proofreading 5) Publishing |
| 1.03.04.01 | Use journal writing as a pre-writing and learning tool |
| 1.03.04.02 | Revise and accurately edit both their own and other's written work |
| 1.03.07.00 | Create written summaries of information |
| 1.03.08.00 | Use appropriate techniques for documentation of sources |

Effective Listening Skills

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| 1.04.01.00 | Follow spoken directions |
| 1.04.02.00 | Distinguish between fact and opinion |
| 1.04.03.00 | Make inferences and draw conclusions from verbal and non-verbal messages |
| 1.04.04.00 | Identify and comprehend the main and subordinate ideas in lecture and discussions, questions to clarify information heard, and report accurately what others have said |
| 1.04.05.00 | Restate or paraphrase a conversation to confirm one's own understanding of what was said |
| 1.04.06.00 | Take accurate notes which summarize material presented from spoken |

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1.04.08.00 Critique speeches and other verbal presentations

Critical Viewing/Graphic/bservation Skills

1.05.01.00 Read and understand graphs, charts, and tables to obtain factual information

1.05.0.00 Produce and utilize effective communication skills in the development of graphs, tables, and charts to communicate ideas

1.05.03.00 Critically view historical or contemporary events, via TV or video tape, and make appropriate observations

1.05.05.00 Communicate through use of video tape and computer presentations

**MATHEMATICS**
(Math 104)

Algebra

| | |
|---|---|
| 3.01.01.00 | Solve linear equations |
| 3.01.01.01 | Combine like terms |
| 3.01.01.02 | Use the Distributive Property to remove grouping symbols and the Addition/Subtraction Property to combine like terms to simplify expressions |
| 3.01.01.03 | Solve equations in one variable utilizing one operation |
| 3.01.01.04 | Solve equations in one variable utilizing two or more operations |
| 3.01.01.05 | Describe and use the logic of equivalence in working with equations, inequalities, and functions |
| 3.01.01.06 | Identify variables, constants, terms, expressions, and coefficients |
| 3.01.01.07 | Define absolute value |
| 3.01.01.08 | Evaluate algebraic expressions |
| 3.01.01.09 | Solve the literal equation or formula for a specified variable |
| 3.01.01.10 | Recognize the properties of equalities |
| 3.01.01.11 | Solve a 2x2 system of linear equations by elimination |
| 3.01.01.12 | Solve a 2x2 system of linear equations by substitution |
| 3.01.01.13 | Apply the rules for solving linear equations in one variable |
| 3.01.01.14 | Use formulas |
| 3.01.01.15 | Use handheld graphic calculators to solve linear equations and graph simple functions |
| 3.01.01.16 | Solve linear equations in one variable containing an absolute value symbol |
| 3.01.02.00 | Use properties of exponents |
| 3.01.02.01 | Define exponent |
| 3.01.02.02 | Compare and compute using scientific notation |
| 3.01.02.03 | Determine values for the square root of any natural number |
| 3.01.02.04 | Determine the principal square root and recognize square roots of negatives as being non- |

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| 3.01.02.05 | Divide terms having factors with exponents |
| 3.01.02.06 | Multiply and divide polynomial expressions |
| 3.01.02.07 | Operate with radicals and leave the result in simplified form |
| 3.01.02.08 | Apply the properties of exponents to simplify polynomial expressions |
| 3.01.02.09 | Multiply terms having factors with exponents |
| 3.01.02.10 | Solve radical equations |
| **3.01.03.00** | **Factor a polynomial of two or more terms** |
| 3.01.03.01 | Apply the distributive law in removing common factors |
| 3.01.03.02 | Factor difference of two squares |
| 3.01.03.03 | Factor quadratic trinomials |
| **3.01.04.00** | **Solve linear inequalities and show the solution on a number line** |
| 3.01.04.01 | Combine like terms |
| 3.01.04.02 | Use the Substitution Property to evaluate expressions and formulas |
| 3.01.04.03 | Evaluate algebraic expressions |
| 3.01.04.04 | Use the Distributive Property to remove grouping symbols and the Addition/Subtraction Property to combine like terms to simplify expressions |
| 3.01.04.05 | Identify variables, constants, terms, expressions, and coefficients |
| 3.01.04.06 | Solve equations in one variable utilizing two or more operations |
| 3.01.04.07 | Describe and use the logic of equivalence in working with equations, inequalities, and functions |
| 3.01.04.08 | Solve a linear inequality in one variable using two or more operations |
| 3.01.04.09 | Define absolute value |
| 3.01.04.10 | Solve problems involving statements of inequality |
| 3.01.04.11 | Use interval notation to describe inequalities on a number line |
| 3.01.04.12 | Define and describe the union and intersection of intervals |

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| 3.01.04.13 | Graph inequalities in two variables |
| **3.01.05.00** | **Recognize, relate, and use the equivalent ideas of zeros of a function, roots of an equation, and solutions of an equation in terms of graphical and symbolic representations** |
| 3.01.05.01 | Apply the distributive law in removing common factors |
| 3.01.05.02 | Factor the difference of two squares |
| 3.01.05.03 | Factor quadratic trinomials |
| 3.01.05.04 | Combine like terms |
| 3.01.05.05 | Use the Distributive Property to remove grouping symbols and the Addition/Subtraction Property to combine like terms to simplify expressions |
| 3.01.05.06 | Solve equation in one variable utilizing one operation |
| 3.01.05.07 | Solve equations in one variable utilizing two or more operations |
| 3.01.05.08 | Describe and use the logic of equivalence in working with equations, inequalities, and functions |
| 3.01.05.09 | Identify variables, constants, terms, expressions, and coefficients |
| 3.01.05.10 | Explore and describe characterizing features of functions |
| 3.01.05.11 | Find X and Y intercepts of a line |
| 3.01.05.12 | Decide whether or not a relation is a function. Use function notation. Find domains and ranges |
| 3.01.05.13 | Use set notation to describe and discuss domain and range of a function |
| 3.01.05.14 | Factor perfect square trinomials |
| **3.01.06.00** | **Graph equations** |
| 3.01.06.01 | Develop graphical techniques of solution for problem situations involving functions |
| 3.01.06.02 | Explore and describe characterizing features of functions |
| 3.01.06.03 | Describe problem situations by using and relating numerical, symbolic, and graphical representations |
| 3.01.06.04 | Use the language and notation of functions in symbolic and graphing settings |
| 3.01.06.05 | Find X and Y intercepts of a line |
| 3.01.06.06 | Write equations for a line |



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| 3.01.06.07 | Use a graphing calculator or computer to generate the graph of a function |
| 3.01.06.08 | Graph a linear equation using the slope-intercept method |
| 3.01.06.09 | Translate among tables, algebraic expressions, and graphs of functions |
| 3.01.06.10 | Estimate shape of graphs of various functions and algebraic expressions |
| 3.01.06.11 | Use handheld graphic calculators to solve linear equations and graph simple functions |
| 3.01.06.12 | Graph basic functions using the Cartesian coordinate system |
| 3.01.06.13 | Derive the equation of a line given two points of the line, one point and the slope, or slope and Y intercept |
| **3.01.07.00** | **Demonstrate the ability to translate statements and equations from written to algebraic form and algebraic to written form** |
| **3.01.08.00** | **Determine slope, midpoint, and distance** |
| 3.01.08.01 | Solve problems related to sets of points on a Cartesian coordinate system |
| 3.01.08.02 | Calculate the slope of a line using the coordinates of two points of the line or a graph of the line |
| **3.01.09.00** | **Model real-world phenomena with polynomial and exponential functions** |
| 3.01.09.01 | Use curve fitting to predict from data |
| 3.01.09.02 | Graph exponential functions which model real world statistics (e.g., population growth, radioactive decay) |

Geometry

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| **3.02.01.00** | **Find perimeters, surface areas and volumes of geometric figures** |
| 3.02.01.01 | Recognize and classify two-and three-dimensional figures (e.g., circles, triangles, rectangles, cylinders, prism) |
| 3.02.01.02 | Create and interpret drawings of three-dimensional objects |
| 3.02.01.03 | Classify, label, and describe polygons and solids |
| 3.02.01.05 | Use handheld graphic calculators to solve area and volume problems |
| 3.02.01.06 | Given the dimensions of various geometric shapes common to the technological industries, determine areas and volumes in English and metric units |
| 3.02.01.07 | Estimate the area of irregular plane figures |

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| 3.02.01.09 | Convert between radians and degrees |
| **3.02.03.00** | **Recognize, classify, and use properties of lines and angles** |
| 3.02.03.01 | Demonstrate an understanding of angles and parallel and perpendicular lines |
| 3.02.03.02 | Define terms related to angles |
| 3.02.03.04 | Demonstrate an understanding of special angles |
| 3.02.03.05 | Understand the various units of measure of angles |
| 3.02.03.06 | Identify points, lines, and planes |
| 3.02.03.07 | Use the concept of betweeness |
| 3.02.03.08 | Measure angles correctly |
| 3.02.03.09 | Convert between radians and degrees |
| **3.02.04.00** | **Describe and apply the properties of similar and/or congruent figures** |
| 3.02.04.01 | Be able to make scale drawings |
| **3.02.05.00** | **Solve right triangle problems** |
| 3.02.05.01 | Apply the Pythagorean Theorem |
| 3.02.05.02 | Identify basic functions of sine, cosine and tangent |
| 3.02.05.03 | Compute and solve problems using basic trigonometric functions |
| **3.02.06.00** | **Demonstrate inductive and deductive reasoning through application to various subject areas** |
| 3.02.06.01 | Demonstrate an understanding of and ability to use proof |

Numbers and Number Relations

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| **3.03.01.00** | **Estimate answers, compute, and solve problems involving real numbers** |
| 3.03.01.01 | Round off decimals to one or more places |
| 3.03.01.02 | Round and/or truncate numbers to designated place value |
| 3.03.01.03 | Round off single and multiple digit whole numbers |
| 3.03.01.04 | Estimate measurements |

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3.03.01.05 Use mental computation when computer and calculator are inappropriate

3.03.01.06 Find the least common denominator of two fractions

**3.03.02.00 Compare and contrast the real number system, the rational number system, and the whole number system**

**3.03.03.00 Determine if a solution to a mathematical problem is reasonable (estimate)**

**3.03.04.00 Select and compute using appropriate units of measure**

3.03.04.01 Convert, compare, and compute with common units of measurement within and/or across measurement systems

3.03.04.02 Use and convert between measurements in the Apothecaries' System of Measurement

3.03.04.03 Use the correct notations from the Apothecaries' System of Measurement

Data Analysis and Probability

**3.04.01.00 Collect and organize data into tables, charts, and graphs**

3.04.01.01 Take a random sample from a population

**3.04.03.00 Understand and apply measures of central tendency, variability, and correlation**

3.04.03.01 Compute and interpret means (averages)

3.04.03.02 Compute and interpret median and/or mode

3.04.03.03 Understand what a normal distribution is

3.04.03.04 Understand what a uniform distribution is

Technical Algebra

**3.05.01.00 Evaluate and graph functions using rectangular coordinates**

3.05.01.01 Graph inequalities in two variables

**3.05.02.00 Solve systems of linear equations and inequalities using matrices, graphs, and algebraic methods**

3.05.02.01 Solve systems of linear equations with up to 3 variables

3.05.02.02 Solve a 2x2 system of linear equations using matrices

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| **3.05.03.00** | **Understand the complex number system and exhibit facility with its operation** |
| 3.05.03.01 | Solve problems having complex solutions |
| 3.05.03.02 | Examine complex numbers as zeros of a function |
| 3.05.03.08 | Add, subtract, multiply and divide complex numbers in rectangular form |
| **3.05.04.00** | **Analyze exponential functions** |
| 3.05.04.02 | Do calculations involving exponential expressions and functions |
| 3.05.04.04 | Graph exponential functions |
| 3.05.04.06 | Use graphing calculators to generate tables to plot exponential curves |
| **3.05.05.00** | **Simplify and solve quadratic equations** |
| 3.05.05.01 | Simplify algebraic expressions, multiply and divide polynomials, and solve quadratic equations |
| 3.05.05.02 | Solve a quadratic equation by factoring, by completing the square, and by using the quadratic formula |
| 3.05.05.03 | Calculate the discriminant of a quadratic equation |
| 3.05.05.04 | Put a quadratic equation in standard form and identify a, b, and c |
| 3.05.05.05 | Draw conclusions about the solutions of a quadratic equation based upon the value of the discriminant |
| 3.05.05.06 | Use a handheld graphic calculator to find the real solutions of a quadratic function to within stated limits of accuracy |
| **3.05.06.00** | **Analyze rational functions** |
| 3.05.06.01 | Simplify rational expressions |
| 3.05.06.02 | Find the least common denominator of two rational expressions |
| 3.05.06.03 | Add, subtract, multiply and divide rational expressions |
| 3.05.06.04 | Solve rational equations |
| 3.05.06.05 | Identify and describe domain and range of rational functions |
| 3.05.06.06 | Define asymptote |
| 3.05.06.07 | Identify and describe the asymptotes of a rational function and recognize their significance |

3.05.06.08 Graph rational functions using a handheld graphic calculator

3.05.06.09 Use a handheld graphic calculator to find any intercepts of a rational function to within stated limits of accuracy

Technical Trigonometry

**3.06.02.00 Recognize and identify graphs of the trigonometric functions**

3.06.02.01 Recognize and graph basic trig curves

****ORGANIC CHEMISTRY ****
**Chemistry in the Community**

**Competency 4.03.01 Supplying Our Water Needs**

4.03.01.01 List and use the units f the modernized metric system in measurements of length, volume, mass, and density.

4.03.01.02 Discuss direct and indirect water uses and their importance for water conservation.

4.03.01.03 Describe the function and operation of the hydrological cycle and indicate the primary storage reservoirs of the earth's water supply.

4.03.01.04 Discuss some effects of water's unusual physical properties on plants and animals.

4.03.01.05 Define the terms solution, solvent, and solute, and apply them in an example.

4.03.01.06 Classify matter in terms of elements, compounds, and mixtures; and distinguish between different types of mixtures in a lab setting.

4.03.01.07 Interpret the symbols and formulas in a balanced chemical equation in terms of atoms and molecules.

4.03.01.08 Describe the three basic subatomic particles and their connection to the polarity and solubility of a compound.

4.03.01.09 Define the terms insoluble, unsaturated, saturated, and supersaturated, and calculate solution concentration as a percentage.

4.03.01.10 Use solubility curves to describe the effect of temperature on solubility, and calculate percent saturation.

4.03.01.11 Demonstrate the ability to organize and interpret environmental or other data in graphs or tables.

4.03.01.12 Given the pH of a substance, classify it as acidic, basic, or neutral.

4.03.01.13 Determine the formula and name of a simple ionic compound when provided with the anion's and cation's names and charges.

4.03.01.14 Evaluate the risks of contaminants in our water supply, with particular attention to heavy-metal ions of lead, mercury and cadmium.

4.03.01.15 Compare and contrast natural and artificial water purification systems, and assess the risks and benefits of water softening and chlorination.

**Competency 4.03.02 Conserving Chemical Resources**

4.03.02.01 Compare and contrast science and technology.

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4.03.02.02 State the law of conservation of matter, and apply the law by determining whether a given chemical equation is balanced.

4.03.02.03 Describe the Spaceship Earth analogy, and apply it to the terms "throw away" and "using up."

4.03.02.04 List common types and sources of municipal waste, and describe attempts to reuse and recycle waste.

4.03.02.05 Define and give examples of renewable and nonrenewable resources.

4.03.02.06 Distinguish between chemical and physical changes and/or properties when given specific examples of each.

4.03.02.07 Classify selected elements as metals, nonmetals, or metalloids based on observations of their chemical and physical properties.

4.03.02.08 Use the periodic table to predict physical and chemical properties of an element, write formulas for various compounds, identify elements by their atomic masses and atomic numbers, and locate periods and groups of elements.

4.03.02.09 Construct a workable periodic table and explain its organization, given chemical and physical properties of a set of elements.

4.03.02.10 Compare the reactivities of selected elements, and explain the results in terms of the structure of their atoms.

4.03.02.11 Discuss the development of new materials as substitutes for dwindling resources.

4.03.02.12 Explain from a chemical viewpoint the problems and solutions involved in restoring the Statue of Liberty.

4.03.02.13 List the three primary layers of our planet and some resources that are mined from each region.

4.03.02.14 Write balanced chemical equations and relate them to the law of conservation of matter.

4.03.02.15 Define the term mole, and calculate the molar mass of a compound when provided with its formula and the atomic masses of its elements.

4.03.02.16 Outline the production of a metal from its ore and list four factors which determine the profitability of mining.

4.03.02.17 Calculate the percent composition by mass of a specified element in a given compound.

4.03.02.18 Define oxidation and reduction, and compare the three most common

redox-reaction methods for separating metals from their ores.

4.03.02.19 Use supply and demand data to estimate the lifetime of a given resource, and discuss options such as reusing, recycling, and substitution.

**Competency 4.03.03 Petroleum: To Build or to Burn?**

4.03.03.01 Compare the usage of petroleum for building and burning and the benefits and burdens of each usage.

4.03.03.02 Identify regions of high petroleum usage and regions of petroleum reserves, and discuss the economic and political implications of petroleum supply and demand.

4.03.03.03 Describe the chemical makeup of petroleum and its differences from other resources.

4.03.03.04 Identify differences in density and viscosity among common petroleum products, and explain the relationship between the differences and the number of carbon atoms in their molecules.

4.03.03.05 Describe the process of fractional distillation, and list the five major fractions of petroleum distillation and typical products manufactured from each fraction.

4.03.03.06 Name the first ten alkanes and draw structural and electron-dot formulas for each.

4.03.03.07 Describe the processes involved in ionic and covalent bonding.

4.03.03.08 State and explain the effect of carbon length and side groups on the boiling point of a hydrocarbon.

4.03.03.09 Define the term isomer and draw structural formulas for a least three isomers of a given hydrocarbon.

4.03.03.10 Trace the history of energy sources and consumption patterns in the United States, and account for major changes.

4.03.03.11 Explain endothermic and exothermic reactions in terms of bond breaking and bond forming, and give examples of each type of reaction.

4.03.03.12 Identify energy conversions in an automobile, and calculate savings resulting from increased automobile efficiency.

4.03.03.13 Define the terms heat of combustion and specific heat and calculate energies of various combustion reactions.

4.03.03.14 Write balanced equations for the combustion of hydrocarbon fuels, including energy changes.

4.03.03.15 Define the term octane number, state its relationship to grades of gasoline, and identify two ways of increasing octane number.

4.03.03.16 Compare saturated and unsaturated hydrocarbons in terms of molecular models, formulas, structures, and physical and chemical properties.

4.03.03.17 Identify the functional groups for common alcohols, ethers, carboxylic acids, and esters.

4.03.03.18 Describe polymerization and give one example of addition and condensation reactions.

4.03.03.19 Describe major sources of energy for the United States of today, and alternative sources of fuels for the future.

**Competency 4.03.04 Understanding Foods**

4.03.04.01 Compare the uses of food in terms of building and burning.

4.03.04.02 Distinguish malnutrition from undernutrition, and identify parts of the world where these problems are most acute.

4.03.04.03 Define calorie and joule, and calculate energy changes from calorimetry data.

4.03.04.04 Correlate weight gain or loss with caloric intake and human activity.

4.03.04.05 Compare and contrast mono-, di-, and polysaccharides in terms of structural formulas and properties.

4.03.04.06 Identify key functional groups in carbohydrates and fats, and write an equation for the formation of a typical fat.

4.03.04.07 Distinguish between saturated and unsaturated fats, and relate the consumption of each to health.

4.03.04.08 Define and illustrate the concept of limiting reactant in biochemical examples and in calculations.

4.03.04.09 Describe how functional groups in amino acids interact in protein formation.

4.03.04.10 Describe five functions of proteins in the body.

4.03.04.11 Discuss the concepts of essential amino acids, complete protein, and complementary protein, with respect to a balanced diet.

4.03.04.12 Separate and measure protein and carbohydrates in nonfat mil, and calculate a sample's caloric value.

4.03.04.13 Distinguish water-soluble from fat-soluble vitamins and discuss the

implications of these differences in terms of dietary needs.

4.03.04.14 Analyze the vitamin C content of foods by performing titrations.

4.03.04.15 Identify minerals used in the body, and distinguish between macrominerals and trace minerals.

4.03.04.16 Determine the iron content of foods by colorimetry.

4.03.04.17 Discuss the relative risks and benefits of various type of food additives in , terms of their purposes and provide specific examples.

4.03.04.18 Discuss the role of the Food and Drug Administration and federal regulations in ensuring food safety.

4.03.04.19 Compare and contrast menus from several cultures in terms of calories and nutritional balance, and analyze the nutritional quality of food recorded in a personal food diary.

**Competency 4.03.05 Nuclear Chemistry in Our World**

4.03.05.01 List at least three examples of nuclear technology and or natural radioactivity that affect daily life.

4.03.05.02 Distinguish between ionizing and nonionizing radiation and their biological effects.

4.03.05.03 Discuss general properties of electromagnetic radiation, and specific properties of various regions of the electromagnetic spectrum.

4.03.05.04 Describe the experiments of Roentgen, Becquerel, the Curies, and Rutherford, and explain how they led to modifications in the atomic model.

4.03.05.05 Describe the properties and locations of the three major subatomic particles.

4.03.05.06 Define the term isotope, and interpret isotope notation.

4.03.05.07 Use molar masses and isotopic abundance data to calculate average mass and relative abundance of elements.

4.03.05.08 Compare and contrast the general properties of alpha, beta, and gamma radiation, including penetrating power, and discuss safety considerations in terms of shielding abilities of cardboard, glass, and lead.

4.03.05.09 Balance nuclear equations and use them to describe natural radioactive decay.

4.03.05.10 Explain the concept of half-life and discuss the implications of half-life for natural radioactivity and nuclear waste disposal

4.03.05.11 Describe radiation detectors and their operating principles.

4.03.05.12 Define nuclear transmutation and write a nuclear equation to illustrate the process.

4.03.05.13 Distinguish nuclear fission from nuclear fusion.

4.03.05.14 Use the equation E = mc2 to compare the energies produces by nuclear fission and by typical exothermic chemical reactions.

4.03.05.15 Explain the energy effects of a chain reaction and compare a controlled and an uncontrolled reaction.

4.03.05.16 Identify the main components of a nuclear power plant and describe their functions.

4.03.05.17 Assess relative risks and benefits of various nuclear technologies.

4.03.05.18 List and briefly explain some factors that determine the amount of biological radiation damage.

4.03.05.19 Compare the ionizing radiation produced by various sources, including radon, that are encountered by a typical United States citizen.

4.03.05.20 Discuss the problems and possible solutions associated with nuclear waste generation and disposal.

**Competency 4.03.06 Chemistry, Air and Climate**

4.03.06.01 Describe common physical and chemical properties of air.

4.03.06.02 Compare the chemical properties of nitrogen, oxygen, and carbon dioxide.

4.03.06.03 Identify the major components of the troposphere and indicate their relative concentrations.

4.03.06.04 Show how Avogadro's Law and the concept of molar volume clarify the interpretation of chemical equations involving gases.

4.03.06.05 Describe with words and mathematical equations the interrelationships among amount, temperature, volume, and pressure of a gas, and list one practical application of each law

4.03.06.06 Define and apply in appropriate situations the terms molar volume, standard temperature and pressure, Kelvin temperature scale, and absolute zero.

4.03.06.07 Sketch or graph the relationship between altitude and air pressure.

4.03.06.08 Discuss air pressure and explain how to measure it.

4.03.06.09 Account for the gas laws in terms of the kinetic molecular theory of gases.

4.03.06.10 Compare the various components of solar radiation.

4.03.06.11 Describe how reflection, absorption and re-radiation of solar radiation account for the earth's energy balance.

4.03.06.12 Explain how differing heat capacities and reflectivities of various land covers and water can influence local climates.

4.03.06.13 Describe the greenhouse effect, its natural incidence and causes, and the significance of industrial contributions.

4.03.06.14 Use graphical extrapolation to predict future CO2 concentrations, and outline assumptions and problems associated with such predictions.

4.03.06.15 Compare the production of CO2 from combustion with that from respiration.

4.03.06.16 Describe the function of the ozone layer and how human activities may be affecting it.

4.03.06.17 List the major categories of air pollutants and discuss the relative contributions of various human and natural factors to each category.

4.03.06.18 Describe major general strategies for controlling pollution, and specific strategies for particulates.

4.03.06.19 Describe chemical reactions and geographic and meteorological factors which contribute to photochemical smog.

4.03.06.20 Interpret graphs and tables related to automotive-induce air pollution.

4.03.06.21 Explain the role of activation energy in a chemical reaction, and give and example of how a catalyst affects it.

4.03.06.22 Describe the role of catalytic converters in reducing automotive emissions of unburned hydrocarbons, carbon monoxide, and nitrogen oxides.

4.03.06.23 Describe sources and consequences of acid rain.

4.03.06.24 Define the terms acid and base, give examples, of each, and describe their formation with balanced ionic equations, and relate hydrogen ion concentration to the pH scale.

4.03.06.25 Interpret historical emissions data to assess the success of various pollution control efforts.

4.03.06.26 Discuss air pollution in terms of the trade-offs between control and damage costs.

**Competency 4.03.07 Health: Your Risks and Choices**

4.03.07.01 Provide examples of correlation, and determine the causal relationship between the members of a given pair of events.

4.03.07.02 Define epidemiology, and describe some benefits and limitations of epidemiological studies.

4.03.07.03 Define homeostasis and give examples of how it is related to maintaining good health.

4.03.07.04 Describe the major elements of the human body and their function in maintaining good health.

4.03.07.05 Explain how enzymes work and list several factors that may alter their effectiveness.

4.03.07.06 Describe cellular energy production and storage, including the role of ATP.

4.03.07.07 Define and give examples of acids and bases, and use net ionic equations to describe the neutralization reaction.

4.03.07.08 Describe the components of a buffer and explain how it prevents acidosis and alkalosis.

4.03.07.09 Apply the concept of like dissolves like to skin cleansing and the function of soap.

4.03.07.010 Sketch the parts of human skin and describe their functions.

4.03.07.11 Describe the effect of sunlight on skin and the effectiveness of PABA in sunscreens.

4.03.07.12 Describe hair structure, the types of bonding in hair protein, and the effects of various hair treatment chemicals on hair.

4.03.07.13 Distinguish between drugs and toxins, and describe circumstances where a substance's usual effect on homeostasis may be reversed.

4.03.07.14 Use the concept of receptors to account for drug specificity and for the action of narcotic analgesics.

4.03.07.15 Contrast the benefits and burdens associated with aspirin use.

4.03.07.16 Outline the effects of common drugs on the human body, and the body's chemical defenses against these drugs.

4.03.07.17 Discuss the role of antigen-antibody complexes in protecting the body against infectious organisms, and contrast the AIDS virus to other viruses.

4.03.07.18 Use the concept of synergism to explain the hazards of combining drugs and medicines.

4.03.07.19 Evaluate the products of cigarette smoking.

4.03.07.20 Assess personal control of risks in terms of the maintenance of good

health and well-being.

**Competency 4.03.08 The Chemical Industry: Promise and Challenge**

4.03.08.01 List the functions of the chemical industry and the general categories of industrial products, including present contributions and future expectations.

4.03.08.02 Contrast responsibilities of the public and of industry in preserving the quality of life in a community.

4.03.08.03 Outline the types of products produced by the chemical industry, and explain the importance of intermediates in production.

4.03.08.04 Evaluate the potentially positive and negative impacts of a chemical industry on a community.

4.03.08.05 Compare natural and synthetic products, providing examples of each.

4.03.08.06 Describe the role of chemical engineers in industry, and the factors that must be considered in changing from laboratory-scale reaction levels to industrial levels.

4.03.08.07 Outline the major divisions and departments of a typical chemical industry, and explain their interrelationships.

4.03.08.08 Analyze a fertilizer sample for its major components, and describe their importance in agriculture.

4.03.08.09 Use colorimetry to quantify phosphate content in fertilizer samples.

4.03.08.10 Apply oxidation-reduction concepts to nitrogen fixation in the Haber process.

4.03.08.11 Use electronegativity values to determine oxidation states.

4.03.08.12 Describe factors that must be controlled in the equilibrium synthesis of ammonia.

4.03.08.13 Trace the history and development of explosives, including the contributions of Alfred Nobel.

4.03.08.14 Develop and evaluate voltaic cells, using the activity series of common metals.

4.03.08.15 Use the concept of half-reactions to describe commercial electrochemical cells, including their charging and discharging reactions.

4.03.08.16 Demonstrate the technique of electroplating.

4.03.08.17 Describe the industrial applications of electrolysis for brine decomposition and for aluminum production.

4.03.08.18 Identify key considerations involved in the development of a new

chemical process or product.

**Competency 4.03.08 Atomic Theory**

4.03.08.01 Describe a mechanism of bond formation and identify the type of chemical bond formed as ionic, covalent, or metallic.

4.03.08.02 Relate the concept of periodicity to atomic properties and the periodic table of elements.

4.03.08.03 Describe charge and ionic compounds in the context of electrochemcial theories.

4.03.08.04 Recognize that the atomic model is only a model and, like any model, is subject to change.

4.03.08.05 Recognize that the atomic model is only a model and, like any model, is subject to change

4.03.08.06 Demonstrate an atomic theory which includes atomic structure, components and their properties, interactions and theory models

4.03.08.07 Demonstrate knowledge of chemical symbolism which will include symbols, formulas, and equations.

**Competency 4.03.09 Matter and energy**

4.03.09.01 Theme of matter which includes elements, compounds, and mixtures.

4.03.09.02 Relate a chemical equation to the concept of chemical change.

4.03.09.03 Classify matter according to properties and composition.

4.03.09.04 Predict the properties of matter based on data provided in pictures, drawings, charts, graphs, tables, mathematical expressions, and scientific literature.

4.03.09.05 Describe the conservation laws and correctly use the standard units for these laws in relation to conservation of mass/energy and conservation of charge.

4.03.09.06 Describe properties of carbon and organic molecules.

4.03.09.07 State the laws of chemical combinations.

4.03.09.08 List assumptions of the kinetic theory of matter.

4.03.09.09 Understand chemical changes during combustion, and the relationship between these changes and the carbon cycle, and relationship to the greenhouse effect.

4.03.09.10 Manipulate data in problem solving, including: mole problems, concentration problems, gas law problems atomic/molecular structure problems and equation balancing.

4.03.09.11 Discuss the concept of mole.

4.03.09.12 State the properties of gases and the laws that apply to gases.

4.03.09.13 Identify applications of Avogadro's hypothesis such as Avogadro's number, molar volume, and gram molecular weight/molar mass.

4.03.09.14 Use the kinetic molecular theory to explain states of matter, rates of reaction, and chemical equilibrium.

****GEOLOGY AND HYDROLOGY****

**Competency 4.04.01 The Study of Geology**

4.04.01.01 Compare the Earth to a giant machine.

4.04.01.02 Discuss why understanding geology is useful to everyday living.

4.04.01.03 Outline geologic time and utilize that outline to construct a timeline of the earth's history.

**Competency 4.04.02 Atoms, Elements, and Minerals**

4.04.02.01 List and describe the most common geologic atoms and element.

4.04.02.02 Describe the chemical composition of the earth's crust.

4.04.02.03 Sketch and label the silica tetrahedron.

4.04.02.04 List and describe the chemical and physical properties of the 12 most common minerals.

4.04.02.05 Explain the rock cycle.

**Competency 4.04.03 Volcanism**

4.04.03.01 Describe the formation of the Hawaiian geologic complex.

4.04.03.02 List and describe the major volcanic catastrophes affecting humans in recorded history.

4.04.03.03 Identify the major gases involved in volcanism and discuss their biological effects.

4.04.03.04 Discuss the composition and texture of extrusive rocks.

4.04.03.05 Compare and contrast shield volcanoes, cinder cones, composite volcanoes and volcanic dunes.

**Competency 4.04.04 Origin of Igneous Rocks**

4.04.04.01 Demonstrate the ability to identify and classify intrusive igneous rocks.

4.04.04.02 Explain the abundance and distribution of plutonic rocks.

4.04.04.03 Describe how magma forms.

4.04.04.04 State what Bowen's Reaction Theory is and its relationship to differentiation.

4.04.04.05 Identify the pattern of volcano locations on earth and explain the relationship to plate-techtonics

**Competency 4.04.05 Weathering and Soil**

4.04.05.01 Discuss the effects of weathering on rocks.

4.04.05.02 Compare and contrast frost action, abrasion, and pressure release.

4.04.05.03 Analyze the role of each of the following chemical weathering agents or reactions: oxygen, acid, solution weathering, feldspar weathering, weathering products.

4.04.05.04 Sketch and label local soil horizons.

4.04.05.05 Identify and discuss local parent rock sources and the effects of local weather on those sources.

4.04.05.06 Determine land capability classification.

4.04.05.07 Determine erosion rates.

4.04.05.08 Interpret aerial photos.

4.04.05.09 Interpret soil survey maps.

4.04.05.10 Identify erosion types.

4.04.05.11 Identify erosion causes.

4.04.05.12 Identify soil erosion control methods.

**Competency 4.04.06 Identify soil characteristics**

4.04.06.01 Follow general lab safety precautions.

4.04.06.02 Identify the soil horizons of given soil samples.

4.04.06.03 Calculate land slope.

4.04.06.04 Determine soil texture.

4.04.06.05 Determine soil structure.

4.04.06.06 Determine soil type.

4.04.06.07 Determine soil drainage.

4.04.06.08 Determine soil productivity.

**Competency 4.04.07 Sediments and Sedimentary Rocks**

4.04.07.01 Explain the following paths of sediment: transportation, deposition,

preservation, and lithification

4.04.07.02 Identify the most common types of sedimentary rock.

4.04.07.03 Determine the origin and composition of clastic rocks, carbonate rocks, and other sedimentary rocks such as chert, evaporites, and coal

4.04.07.04 Discuss the formation of and weathering of various sedimentary geologic features.

**Competency 4.04.08 Metamorphism**

4.04.08.01 Describe the composition of metamorphic rocks.

4.04.08.02 Discuss the effect of the following on metamorphic rock : temperature, pressure, stress, foliation, fluid, and time.

4.04.08.03 Identify hydrothermal processes and discuss their potential use as alternative energy sources.

**Competency 4.04.09 Determining Geologic Time**

4.04.09.01 Interpret stratification as a method of determining relative age.

4.04.09.02 Identify the approximate age of the earth as 4.5 billion years old.

4.04.09.03 Describe the geologically very recent presence of humans on earth.

4.04.09.04 List and describe the major radiometric dating procedures.

**Competency 4.04.10 Mass Wasting**

4.04.10.01 Calculate the rate of movement of various geologic materials, given a data chart recording time intervals and movement.

4.04.10.02 Relate the type of movement identified to the type of geologic material moving.

4.04.10.03 Explain the effects of gravity and water on mass wasting.

4.04.10.04 Discuss the following common types of mass wasting : creep, debris flow, rockfalls, rockslides.

4.04.10.05 Outline methods to address mass wasting of debris near human development.

4.04.10.06 Describe and sketch methods of preventing rockfalls and rockslides on highways.

**Competency 4.04.11 Streams and Landscapes**

4.04.11.01 Identify and discuss the stages of the hydrologic cycle.

4.04.11.02 Explain sheet flow.

4.04.11.03 Explain channel flow.

4.04.11.04 Using topographical maps and other information, construct a model or sketch of a drainage basin for a particular geographic area.

4.04.11.05 Discuss the causes and effects of major floods.

4.04.11.06 Explain a flash flood.

4.04.11.07 Evaluate and discuss the effect of each of the following on stream erosion and deposition : velocity, gradient, channel shape, channel roughness, discharge.

4.04.11.08 Using local waterways, identify examples of stream erosion and stream transportation of sediment.

4.04.11.09 List and describe the following examples of stream deposition: bars, braided streams, meandering streams and point bars, flood plains, deltas, and alluvial fans.

4.04.11.10 Classify valley development according to the following methods: downcutting and base level, graded streams, lateral erosion, and headward erosion.

**Competency 4.04.12 Ground Water**

4.04.12.01 Define Porosity and permeability.

4.04.12.02 Arrange various substrates on a scale of highest to lowest porosity and permeability.

4.04.12.03 Determine the water table level of a study area and monitor it for changes.

4.04.12.04 Explain and then compare and contrast aquifers, wells, springs and rivers.

4.04.12.05 List and describe the major sources of pollution of ground water.

4.04.12.06 Discuss remediation techniques for ground water contamination.

4.04.12.07 Construct a mathematical model that balances withdrawal and recharge in a particular hydrologic area.

4.04.12.08 Utilize computer simulation models and programs (such as STELLA) to describe the hydrologic dynamics of a particular watershed.

4.04.12.09 Assess the effects of ground water action on the following processes and events: caves, sinkholes, and Karst topography.

4.04.12.10 Identify regions of the United States and the world where geothermal energy is a viable alternative to fossil fuels.

**Competency 4.04.13 Demonstrate knowledge of the basic concepts of hydrogeology**

4.04.13.01 Create cross-sectional diagrams from information provided.

4.04.13.02 Differentiate between a cross-sectional diagram and a fence diagram.

4.04.13.03 Create potentiometric maps from information provided.

4.04.13.04 Determine the direction of groundwater flow from information provided.

4.04.13.05 Create vertical and horizontal isoconcentration maps from information provided.

4.04.13.06 Take groundwater levels from designated monitoring wells or piezomenters.

4.04.13.07 Determine vertical gradients from the given groundwater level of a three-well nest

4.04.13.08 Describe buried valley aquifers and the significance of the "deep stage".

4.04.13.09 Describe Karst topography.

4.04.13.10 Describe sinkholes, their origins, and implications relative to their surface stability

4.04.13.11 Interpret key hydrogeology terminology (eg., sole source aquifer, isotropy, anisotropy, homogeneity, heterogeneity, losing stream, gaining stream, well field, recharge lagoon, groundwater divide, permeability, effective porosity)

4.04.13.12 Identify the components of Darcy's Law.

4.04.13.13 Describe cones of depression in words and pictures.

4.04.13.14 Describe zones of contribution in words and pictures.

4.04.13.15 Describe zones of influence in words and pictures.

**Competency 4.04.14 Assist in determining the quality and quantity of water resources**

4.04.14.01 Identify the hydrologic cycle and major uses for water.

4.04.14.02 Assist in identifying present and potential sources of water pollution in a local area

4.04.14.03 Assist in determining the quality of given samples of water.

4.04.14.04 Calculate the volume and surface area of ponds, lakes, and streams.

4.04.14.05 Assist in planning improvements for waterways, ponds, stream banks, and shorelines

**Competency 4.04.15 Glaciers and Glaciation**

4.04.15.01 Construct a time-line of the major glaciers that have shaped the students region of the country.

4.04.15.02 Analyze and discuss a map showing the distribution of glaciers.

4.04.15.03 Identify the major types of glaciers.

4.04.15.04 Classify the most common types of glacial erosion and glacial deposition.

**Competency 4.04.16. Demonstrate knowledge of the basic concepts of glacial geology**

4.04.16.01 Develop a chronology of the events associated with glacial advancements.

4.04.16.02 Describe glacial till.

4.04.16.03 Describe outwash deposits and their relevance to groundwater.

4.04.16.04 Describe valley train deposits and their impact on groundwater flow.

4.04.16.05 Describe glacial kame, their origins, and resulting land forms.

4.04.16.06 Describe the characteristics and origins of glacial moraines.

4.04.16.07 Describe the characteristics and origins of glacial drumlins.

4.04.16.08 Describe how glacial advancements reshaped the landscape resulting in present-day drainage patterns (watersheds)

**Competency 4.04.17 Geologic Structures**

4.04.17.01 Define the tectonic forces known as stress and strain.

4.04.17.02 Identify horizontal and inclined layers of rocks in a geologic diagram as discuss the structures as a record of the geologic past.

4.04.17.03 Construct a geologic map of a study area, utilizing data gathered with field techniques.

4.04.17.04 Discuss the geometry and interpretation of geologic folds.

4.04.17.05 On a map of the world, identify the major joint and fault lines.

**Competency 4.04.18 Earthquakes**

4.04.17.01 List and describe the major causes of earthquakes.

4.04.17.02 Define a seismic wave.

4.04.17.03 Relate the effects of earthquakes and tsunamis.

4.04.17.04 Using a world map, illustrate the world distribution of earthquakes and discuss the causes of the distribution pattern.

4.04.17.05 Assess the current techniques for earthquake prediction and control.

**Competency 4.04.18 The Earth's Interior**

4.04.18.01 Sketch and explain the earth's internal composition and structure.

4.04.18.02 Define isostasy.

4.04.18.03 Discuss the earth's magnetic field and gravity measurements.

4.04.18.04 Explain how heat from within the earth is distributed and mechanisms for that heat to reach the surface.

**Competency 4.04.19 Plate Tectonics**

4.04.19.01 Discuss paleomagnetism and recent evidence for continental drift. features of good equipment design

4.04.19.02 Outline the history of continental positions

4.04.19.03 Explain Hess's driving force and the relationship to sea floor spreading.

4.04.19.04 List and describe the following evidence of plate movement: marine magnetic anomalies, fracture zones and transform faults and measurements of direct plate motion.

4.04.19.05 Identify the causes of plate movement.

**Competency 4.04.20 Geologic Resources**

4.04.20.01 List and describe the major types of geologic resources.

4.04.20.02 List and then rank in order the major geologic resources used today.

4.04.20.03 Outline the origin of oil and gas.

4.04.20.04 Identify the areas where there are major occurrences of oil and gas reserves.

4.04.20.05 Explain the most common methods of oil recovery.

4.04.20.06 State the various predictions being made on the amount of oil resources we have left.

4.04.20.07 Distinguish the resources known as heavy crude and oil sands.

4.04.20.08 Discuss the importance and use of oil shade.

4.04.20.09 Identify on a map the location of the major deposits and types of coal reserves.

4.04.20.10 List and describe the environmental effects of mining and burning coal.

4.04.20.11 Trace the history of the use of uranium and the effects of mining and using uranium as a resource.

4.04.20.12 Identify and describe six major alternative sources of energy.

4.04.20.13 List the major metals and ores being mined today.

4.04.20.14 Compare and contrast ores associated with igneous rocks and ores formed by surface processes.

4.04.20.15 Explain the relationship between metal ores and plate tectonics.

4.04.20.16 List and describe the major ore mining techniques and their effects on the environment.

4.04.20.17 List and describe the importance of the following metals: iron, copper, aluminum, lead, zinc, silver, gold.

4.04.20.18 Identify the uses of geologic resources for construction materials and fertilizers and evaporites.

4.04.20.19 Describe the recycling processes being used today for geologic resources and the advantages and disadvantages of recycling compared to newly mined materials.

4.04.20.20 Identify major conservation techniques being used in the private and public sectors to conserve geologic resources.

4.04.20.21 Predict the future trends in the use and development of geologic resources.

## COMPUTER LITERACY

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| **10.04.01.00** | **Demonstrate knowledge of Computer Literacy I for Windows** |
| 10.04.01.01 | Explain what a computer is and how it processes data to produce information |
| 10.04.01.02 | Identify the four operations of the information processing cycle: input, process, output, and storage |
| 10.04.01.03 | Explain how the operations of the information processing cycle are performed by computer hardware and software |
| 10.04.01.04 | Describe the elements of an information system: equipment, software, data, personnel, users, and procedures |
| 10.04.01.05 | Explain the responsibilities of information system personnel |
| 10.04.01.06 | Explain the use of computers in our world |
| 10.04.01.07 | Identify the most widely used general microcomputer software applications and their key processing features |
| 10.04.01.08 | Describe how each application can help users |
| 10.04.01.09 | Explain integrated software and its advantages |
| 10.04.01.10 | List and describe the guidelines for purchasing hardware and software packages |
| 10.04.01.11 | List and describe the learning aids and support tools that help users to use microcomputer applications |
| 10.04.01.12 | Define the types of inputs and outputs and how the computer uses each type |
| 10.04.01.13 | Define data and explain the terms used to describe data: field, record, file, database |
| 10.04.01.14 | Describe the standard features of keyboards, and explain how to use the cursor control and function keys |
| 10.04.01.15 | Explain the types of terminals and how they are used |
| 10.04.01.16 | Explain user interfaces and list the features that a good user interface should have |
| 10.04.01.17 | Discuss how data entry differs in interactive and batch processing |
| 10.04.01.18 | List and explain the systems and procedures associated with data entry |
| 10.04.01.19 | Explain the term ergonomics and describe some of the important features of good equipment design |
| 10.04.01.20 | Identify the components of the processor unit and describe their use |

10.04.01.21 Define a bit and describe how a series of bits in a byte is used to represent characters

10.04.01.22 Discuss how the ASCII and EBCIDIC codes represent characters

10.04.01.23 Discuss the primary factors that affect the speed of the processor unit

10.04.01.24 Describe the characteristics of RAM and ROM memory, and list several other types of memory

10.04.01.25 List the common types of reports that are used for output

10.04.01.26 Describe multimedia

10.04.01.27 Describe the features and classifications of printers

10.04.01.28 Identify and explain the differences of impact and non-impact printers

10.04.01.29 Describe the types of screens available and list common screen features

10.04.01.30 Define auxiliary storage

10.04.01.31 Describe the forms of auxiliary storage used and how special-purpose storage devices are used

10.04.01.32 Explain how data is stored on diskettes, hard disks and tape

10.04.01.33 Explain how data stored on magnetic disks can be protected

10.04.01.34 Explain what data management is and why it is needed

10.04.01.35 Describe sequential files, indexed files, and direct (or relative) files

10.04.01.36 Explain the difference between sequential and random retrieval of record from a file

10.04.01.37 Describe the data maintenance procedures for updating data including adding, changing, and deleting

10.04.01.38 Discuss the advantages of a database management system (DBMS)

10.04.01.39 Define and describe the basic components of a communications system

10.04.01.40 Describe the various transmission media and line configurations used for communication channels

10.04.01.41 Identify and explain the communications equipment used in a communications system

10.04.01.42 Describe the functions performed by communications software including how data is transmitted

10.04.01.43 List the major categories of networks and describe the common network

configurations

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| 10.04.01.44 | Describe how bridges and gateways are used to connect networks |
| 10.04.01.45 | Define the term management information systems and explain how information is important to an organization |
| 10.04.01.46 | Discuss the different levels in an organization and how the information requirements differ for each level |
| 10.04.01.47 | Define the term information system and identify the elements of an information system |
| 10.04.01.48 | Describe the different types of information systems and the trend toward integration |
| 10.04.01.49 | Explain how personal computers are used in management information systems |
| 10.04.01.50 | Discuss how electronic devices and applications are used in the automated office |
| 10.04.01.51 | Describe the technologies that are developing for the automated factory |
| 10.04.01.52 | Discuss the trend toward computer-integrated enterprise |
| 10.04.01.53 | Discuss the use of personal computers in the home |
| 10.04.01.54 | Describe the methods used in computer-aided instruction (CAI) |
| 10.04.01.55 | Explain the guidelines for purchasing personal computers |
| 10.04.01.56 | Discuss the social issues relating to computers |
| 10.04.01.57 | Define data and information |
| 10.04.01.58 | Describe the use and handling of diskettes and hard disks |
| 10.04.01.59 | Discuss computer software and explain the difference between application software and system software |
| 10.04.01.60 | Describe what a graphic user interface (GUI) is |
| 10.04.01.61 | Identify the elements of a window |
| 10.04.01.62 | Perform basic mouse operations |
| 10.04.01.63 | Perform the following window operations; choose a command from a menu; respond to dialogue boxes; name a file; explain what a directory, subdirectory and path are; open, enlarge and scroll a window; and obtain on-line help while using an application |

****EMPLOYABILITY SKILLS****

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| **11.02.01.00** | **Investigate career options** |
| 11.02.01.01 | Determine interests and aptitudes |
| 11.02.01.02 | Identify career options |
| 11.02.01.03 | Research occupations matching interests and aptitudes |
| 11.02.01.04 | Select career(s) that best match(es) interests and aptitudes |
| 11.02.01.05 | Identify advantages and disadvantages of career options, including nontraditional careers, hours of work, offshift, weekends, and holidays |
| 11.02.01.06 | Assess differences in wages, annual incomes, and job opportunities based on geographical location |
| 11.02.01.07 | Develop a career plan |
| 11.02.02.00 | Analyze potential barriers to employment |
| 11.02.02.01 | Identify common barriers to employment |
| 11.02.02.02 | Describe strategies to overcome employment barriers |
| **11.02.03.00** | **Apply decision-making techniques in the workplace** |
| 11.02.03.01 | Identify the decision to be made |
| 11.02.03.02 | Compare alternatives |
| 11.02.03.03 | Determine consequences of each alternative |
| 11.02.03.04 | Make decisions based on values and goals |
| 11.02.03.05 | Evaluate the decision made |
| **11.02.04.00** | **Apply problem-solving techniques in the workplace** |
| 11.02.04.01 | Diagnose the problem and its causes |
| 11.02.04.02 | Identify alternatives and their consequences in relation to the problem |
| 11.02.04.03 | Examine multicultural and nonsexist dimensions of problem solving |
| 11.02.04.04 | Utilize resources to explore possible solutions to the problem |
| 11.02.04.05 | Compare and contrast the advantages and disadvantages |

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| 11.02.04.06 | Determine appropriate action |
| 11.02.04.07 | Evaluate results |
| **11.02.05.00** | **Evaluate the relationship of self-esteem to work ethic** |
| 11.02.05.01 | Identify special characteristics and abilities in self and others |
| 11.02.05.02 | Identify internal and external factors that affect self-esteem |
| 11.02.06.00 | Analyze the relationship of personal values and goals to work ethic in and out of the workplace |
| 11.02.06.01 | Distinguish between values and goals |
| 11.02.06.02 | Determine the importance of values and goals |
| 11.02.06.03 | Evaluate how values affect goals |
| 11.02.06.04 | Identify short-term and long-term goals |
| 11.02.06.05 | Prioritize personal goals |
| 11.02.06.06 | Describe how personal values are reflected in work ethic |
| 11.02.06.07 | Describe how interactions in the workplace affect personal work ethic |
| **11.02.07.00** | **Demonstrate work ethic** |
| 11.02.07.01 | Examine factors that influence work ethic |
| 11.02.07.02 | Exhibit characteristics that reflect an appropriate work ethic |
| **11.02.08.00** | **Prepare for employment** |
| 11.02.08.01 | Identify traditional and nontraditional employment sources |
| 11.02.08.02 | Utilize employment sources |
| 11.02.08.03 | Research job opportunities, including nontraditional careers |
| 11.02.08.04 | Interpret equal employment opportunity laws |
| 11.02.08.05 | Explain the critical importance of personal appearance, hygiene, and demeanor throughout the employment process |
| 11.02.08.06 | Prepare for generic employment tests and those specific to an occupation/organization |
| 11.02.09.00 | Design a resume |

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| 11.02.09.01 | Identify personal strengths and weaknesses |
| 11.02.09.02 | List skills and/or abilities, career objective(s), accomplishments/achievements, educational background, and work experience |
| 11.02.09.03 | Demonstrate legible written communication skills using correct grammar, spelling, and concise wording |
| 11.02.09.04 | Complete resume using various formats |
| 11.02.09.05 | Secure references |
| **11.02.10.00** | **Complete and process job application forms** |
| 11.02.10.01 | Explain the importance of an application form |
| 11.02.10.02 | Identify ways to obtain job application forms |
| 11.02.10.03 | Describe methods for handling illegal questions on job application forms according to EOE regulations |
| 11.02.10.04 | Demonstrate legible written communication skills using correct grammar, spelling, and concise wording |
| 11.02.10.05 | Return application to proper person, request interview, and follow up |
| **11.02.11.00** | **Demonstrate interviewing skills** |
| 11.02.11.01 | Investigate interview environment and procedures |
| 11.02.11.02 | Explain the critical importance of personal appearance, hygiene, and demeanor |
| 11.02.11.03 | Demonstrate question and answer techniques |
| 11.02.11.04 | Demonstrate methods for handling difficult and/or illegal interview questions following EOE guidelines |
| 11.02.12.00 | Secure employment |
| 11.02.12.01 | Identify present and future employment opportunities within an occupation/organization |
| 11.02.12.02 | Research the organization/company |
| 11.02.12.03 | Use follow-up techniques to enhance employment potential |
| 11.02.12.04 | Compare and evaluate job offers |
| **11.02.13.00** | **Analyze the organizational structure of the workplace** |

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| 11.02.13.01 | Identify and evaluate employer expectations regarding job performance, work habits, attitudes, personal appearance, and hygiene |
| 11.02.13.02 | Be aware of and obey all company policies and procedures |
| 11.02.13.03 | Examine the role/relationship between employee and employer |
| 11.02.13.04 | Recognize opportunities for advancement and reasons for termination |
| **11.02.14.00** | **Maintain positive relations with others** |
| 11.02.14.01 | Exhibit appropriate work habits and attitude |
| 11.02.14.02 | Identify behaviors to establish successful working relationships |
| 11.02.14.03 | Cooperate and compromise through teamwork and group participation |
| 11.02.14.04 | Identify alternatives for dealing with harassment, bias, and discrimination based on race, color, national origin, sex, religion, handicap, or age |
| **11.02.15.00** | **Analyze opportunities for personal and career growth** |
| 11.02.15.01 | Determine opportunities within an occupation/organization |
| 11.02.15.02 | Compare and contrast other opportunities |
| 11.02.15.03 | List benefits of job advancement |
| 11.02.15.04 | Evaluate factors involved when assuming a new position within or outside an occupation/organization |
| **11.02.16.00** | **Exhibit characteristics needed for advancement** |
| 11.02.16.01 | Display a positive attitude |
| 11.02.16.02 | Demonstrate knowledge of a position |
| 11.02.16.03 | Perform quality work |
| 11.02.16.04 | Adapt to changing situations and technology |
| 11.02.16.05 | Demonstrate capability for different positions |
| 11.02.16.06 | Participate in continuing education/training programs |
| 11.02.16.07 | Respect, accept, and work with ALL individuals in the workplace |
| **11.02.17.00** | **Assess the impact of technology in the workplace** |
| 11.02.17.01 | Cite how past business/industry practices have influenced present business/industry |

processes

11.02.17.02 Investigate the use of technology in the workplace

11.02.17.03 Analyze how present skills can be applied to learning new technologies

**11.02.18.00 Use a variety of technological applications**

11.02.18.01 Explore basic mathematical, scientific, computer, and technological principles

11.02.18.02 Use technology to accomplish assigned tasks

11.02.18.03 Create solutions to problems using technical means

**11.02.19.00 Apply lifelong learning to individual situations**

11.02.19.01 Define lifelong learning

11.02.19.02 Identify factors that cause the need for lifelong learning

**11.02.20.00 Adapt to change**

11.02.20.01 Analyze the effect of change

11.02.20.02 Identify reasons why goals change

11.02.20.03 Describe the importance of flexibility when reevaluating goals

11.02.20.04 Evaluate the need for continuing education/training

**11.02.21.00 Analyze global enterprise system**

11.02.21.01 Identify characteristics of various enterprise system

11.02.21.02 Examine the relationship between competition, risk, and profit

11.02.21.03 Illustrate how supply and demand influence price

**11.02.22.00 Evaluate personal money management**

11.02.22.01 Describe the need for personal management records

11.02.22.02 Identify methods of taxation

11.02.22.03 Analyze how credit affects financial security

11.02.22.04 Compare types and methods of investments

11.02.22.05 Prepare a personal budget

| | |
|---|---|
| 11.02.22.06 | Be an informed and responsible consumer |
| 11.02.22.07 | Analyze the effects of advertising on the consumer |
| **11.02.23.00** | **Analyze the effects of family on work** |
| 11.02.23.01 | Recognize how family values, goals, and priorities are reflected in the workplace |
| 11.02.23.02 | Identify present and future family structures and responsibilities |
| 11.02.23.03 | Describe personal and family roles |
| 11.02.23.04 | Analyze concerns of parents who work outside the home |
| 11.02.23.05 | Examine how family responsibilities can conflict with work |
| 11.02.23.06 | Resolve family-related conflicts |
| 11.02.23.07 | Explain how to use support systems/community resources to help resolve family-related conflict |
| **11.02.24.00** | **Analyze the effects of work on family** |
| 11.02.24.01 | Identify responsibilities associated with paid and nonpaid work |
| 11.02.24.02 | Compare the advantages and disadvantages of multiple incomes |
| 11.02.24.03 | Explain how work can conflict with family responsibilities |
| 11.02.24.04 | Explain how work-related stress can affect families |
| 11.02.24.05 | Identify family support systems and resources |
| 11.02.24.06 | Identify stress management options to alleviate occupational "burnout" |
| **11.02.25.00** | **Exercise the rights and responsibilities of citizenship in the workplace** |
| 11.02.25.01 | Identify the basic rights and responsibilities of citizenship |
| 11.02.25.02 | Examine the history and contributions of all racial, ethnic, and cultural groups |
| 11.02.26.00 | Cooperate with others in the workplace |
| 11.02.26.01 | Identify situations in which compromise is necessary |
| 11.02.26.02 | Examine how individuals from various backgrounds contribute to work-related situations |
| 11.02.26.03 | Demonstrate initiative to facilitate cooperation |

11.02.26.04 Give and receive constructive criticism to enhance cooperation

**11.02.27.00 Evaluate leadership styles appropriate for the workplace**

11.02.27.01 Identify characteristics of effective leaders

11.02.27.02 Compare leadership styles including non-traditional "coaching"

11.02.27.03 Demonstrate effective delegative skills

11.02.27.04 Identify opportunities to lead in the workplace

**11.02.28.00 Demonstrate effective teamwork skills**

11.02.28.01 Identify the responsibilities of a valuable group member

11.02.28.02 Exhibit open-mindedness

11.02.28.03 Identify methods of involving each member of a team

11.02.28.04 Contribute to the efficiency and success of a group

11.02.28.05 Determine ways to motivate others

11.02.28.06 Explain the advantage of team decisions

11.02.28.07 Prepare and plan an agenda

11.02.28.08 Develop a plan of action

11.02.28.09 Assess success or failure of team

11.02.29.00 Utilize effective communication skills

11.02.29.01 Identify the importance of active listening

11.02.29.02 Demonstrate assertive communication

11.02.29.03 Recognize the importance of verbal and nonverbal cues and messages

11.02.29.04 Analyze written material

11.02.29.05 Prepare written material

11.02.29.06 Give and receive feedback

11.02.29.07 Articulate thoughts

11.02.29.08 Use appropriate language

11.02.29.09 Demonstrate the value of networking

**11.02.30.00 Evaluate the role of small business in the economy**

11.02.30.01 Identify the benefits of small business to a community

11.02.30.02 Analyze opportunities for small business in a community

**11.02.31.00 Examine considerations of starting a business**

11.02.31.01 Research a business idea

11.02.31.02 Compare various ways to become a small business owner

11.02.31.03 Investigate factors to consider in financing a new business

11.02.31.04 Evaluate entrepreneurship as a career option

# SECONDARY/TECHNICAL COMPETENCIES

****ENVIRONMENTAL MANAGEMENT/RESOURCE CONSERVATION****
**Water Quality And Quantity**

**Competency 13.01.01 Monitor water quality and quantity** (EMOCAP)

13.01.01.01 Comply with established laws and regulations concerning the treatment of water.

13.01.01.02 Collect water samples

13.01.01.03 Analyze samples for water quality

13.01.01.04 Implement pollution abatement measures

13.01.01.05 Identify types of well construction and development

13.01.01.06 Control fugitive dusts

13.01.01.07 Identify Class I, Class II , and Class III macroinvertebrates

13.01.01.08 Explain the importance of macroinvertebrates as indicators of water quality

**Competency 13.01.02 Identify and assess stream dynamics** (R)

13.01.02.01 Follow general safety precautions

13.01.02.02 Identify a watershed area

13.01.02.03 Identify disturbances and destructive forces

13.01.02.04 Determine stream profile

13.01.02.05 Evaluate stream corridor improvement

13.01.02.06 Identify nonpoint source pollution

13.01.02.07 Measure stream velocity

13.01.02.08 Measure stream volume

**Competency 13.01.03 Determine water quality parameters** (R)

13.01.03.01 Follow general safety precautions

13.01.03.02 Measure turbidity

13.01.03.03 Measure p.H.

13.01.03.04 Measure temperature

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13.01.03.05 Measure dissolved oxygen

13.01.03.06 Profile dissolved oxygen and temperature

13.01.03.07 Survey macroinvertebrates

13.01.03.08 Identify pollution sources

13.01.03.09 Identify water quality indicators

13.01.03.10 Measure alkalinity

13.01.03.11 Measure residue content

13.01.03.12 Measure fecal coliform count

13.01.03.13 Measure phosphorus level

13.01.03.14 Measure nitrate level

13.01.03.15 Measure sulfate level

13.01.03.16 Measure chloride level

13.01.03.18 Interpret water test results

**Competency 13.01.04 Describe scientific fundamentals necessary for proficient water and wastewater treatment.** (EMAC)

13.01.04.01 Explain basic concepts of general, quantitative, physical and organic chemistry

13.01.04.02 Discuss adaptation to water and wastewater chemistry

13.01.04.03 Explain analytical techniques, sampling, "pitfalls", etc.

13.01.04.04 Explain interfering substance, recognition, effects, etc.

13.01.04.05 Explain chemical analyses of water and wastewater and their interpretation

13.01.04.06 Identify toxic substances

**Competency 13.01.05 Describe Slow Measurement Pumps, Temperature Influences** (EMAC)

13.01.05.01 Explain hydraulics, flow measurement, pumping, pressures, velocities

13.01.05.02 Discuss electricity, measurement, use of electrical energy, equations, etc.

13.01.05.03 Discuss temperature and its effects, heat exchange, etc.

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13.01.05.04 Discuss mechanical energy, motors, transmission

13.01.05.05 Discuss energy conversion equations

13.01.05.06 Discuss weather effects, water cycle

13.01.05.07 Discuss hydraulic, electrical and mechanical tests and their interpretation

**Competency 13.01.06 Demonstrate Understanding of water resources protection, quantity and quality of water** (EMAC)

13.01.06.01 Explain the importance of water quality, upstream and downstream quality

13.01.06.02 Explain dissolved oxygen

13.01.06.03 Explain self-purification, dilution

13.01.06.04 Explain effects of flow, floods, droughts

13.01.06.05 Define water pollution

13.01.06.06 Discuss anticipating water pollution problems, effects on water supplies

**Competency 13.01.07 Describe the theoretical and practical application of processes utilized in water and wastewater treatment** (EMAC)

13.01.07.01 Explain the theory, description and knowledge of the water treatment process

13.01.07.02 Explain wastewater theory, description and knowledge of the treatment processes

13.01.07.03 Create flow diagrams of water and wastewater processes

13.01.07.04 Discuss design criteria: Hydraulic and organic loading, population equivalents, industrial wastes.

13.01.07.05 Explain application of processes

13.01.07.06 Explain limitations of processes

13.01.07.07 Discuss process performance, expected efficiencies, actors affecting performance

13.01.07.08 Discuss processing problems

13.01.07.09 Discuss innovative and alternative processes

13.01.07.10 Discuss evaluation of performance, sampling, analyses, interpretation of analyses, calculating effectiveness

**Competency 13.01.08 Describe the "total" treatment process** (EMAC)

13.01.08.01 Explain the concept of physical, chemical, and biological as related to the treatment process

13.01.08.02 Discuss applications of total treatment

13.01.08.03 Explain limitations of total treatment

13.01.08.04 Explain design criteria

**Competency 13.01.09 Describe effective, responsible operation and maintenance of water and wastewater treatment plants** (EMAC)

13.01.09.01 Discuss raw wastewater coming into the plant

13.01.09.02 Discuss loading at water treatment plants

13.01.09.03 Discuss treatment objectives at water treatment plants

13.01.09.04 Discuss process control at water treatment plants

13.01.09.05 Discuss operating difficulties and problems at water treatment plants

13.01.09.06 Discuss maintenance at a treatment plant

13.01.09.07 Practice safety procedures

13.01.09.08 Respond to simulated emergencies

13.01.09.09 Demonstrate proper laboratory practices

**Competency 13.01.10 Describe Distribution Systems - Water (Class I and Class II)** (EMAC)

13.01.10.01 Discuss description, function, operation and control

13.01.10.02 Explain disinfection of water mains, reservoirs, tanks, etc.

13.01.10.03 Explain maintenance of disinfection residual, public health hazards

13.01.10.04 Discuss breaks in mains, hydrants, reservoirs, procedure for handling and disinfection

13.01.10.05 Discuss storage: ground reservoirs, elevated tanks

13.01.10.06 Discuss pumping: high-service, multiple high service, pumping problems

13.01.10.07 Discuss distribution system maintenance, flushing, cleaning mains, etc.

13.01.10.08 Explain corrosion; its causes and prevention

13.01.10.09 Discuss water shortages

**Competency 13.01.11 Describe Collection Systems - Wastewater (Class I and Class II)** (EMAC)

13.01.11.01 Discuss description, function, operation and control

13.01.11.02 Discuss pollution prevention, by-passing, cleaning, regulators, illegal connections, storm-water connections

13.01.11.03 Discuss pumping, corrosion, electrical and mechanical problems, safety

13.01.11.04 Discuss maintenance, cleaning sewers, safety

13.01.11.05 Discuss infiltration/inflow, rates of inflow, correction

13.01.11.06 Discuss abuse of sewers : improper connections, poor laterals, downspouts, storm water connections

**Competency 13.01.12 Describe proper discharge of duties for a certified operator in responsible charge of a water or wastewater plant or facility** (EMAC)

13.01.12.01 List reasons for water treatment

13.01.12.02 List reasons for wastewater treatment

13.01.12.03 Explain significance of job as water or wastewater plant operator

13.01.12.04 List troubleshooting problems in plant

13.01.12.05 List personal qualities of a supervisor

13.01.12.06 Identify construction cost of wastewater plants

13.01.12.07 Compute unit cost of treatment for operation and maintenance, reserves and principal and interest on bonds

13.01.12.08 Compute unit cost of treatment including operation, maintenance, reserves and principal and interest on bonds

13.01.12.09 Compare consumer cost-comparison to other utilities

13.01.12.10 Use different approaches to problem solving

13.01.12.11 Write a plan for supervision of employees

## LOCAL AND GLOBAL NATURAL RESOURCES

**Competency 13.02.01 Conduct lab and field analyses** (EMOCAP)

13.02.01.01 Perform Biochemical Oxygen Demand (BOD) analyses

13.02.01.02 Perform Chemical Oxygen Demand (COD) analyses

13.02.01.03 Perform specific conductivity analyses

13.02.01.04 Perform suspended solids analyses

13.02.01.05 Measure water hardness

13.02.01.06 Measure water level and flow

**Competency 13.02.02 Identify global food resources and hunger** (EMAC)

13.02.02.01 Differentiate between malnutrition and undernutrition

13.02.02.02 Identify food resource problems within rain forests and semiarid lands

13.02.02.03 Identify the variables that control agricultural production

13.02.02.04 Identify reasons for maintaining soil quality

13.02.02.05 Identify the characteristics of crop irrigation management

13.02.02.06 Identify ways in which biotechnology may influence the future of agricultural science

13.02.02.07 Identify the problems associated with harvesting oceans

13.02.02.08 Identify aquaculture successes and limitations

## RESOURCE MANAGEMENT

**Competency 13.03.01 Describe management of Forests, Rangelands, Parks, and Wetlands** (EMOCAP)

13.03.01.01 Discuss the history of land management

13.03.01.02 Identify congressional mandated areas

13.03.01.03 Outline examples of conflicts facing federal public lands

13.03.01.04 Discuss fire management techniques

13.03.01.05 Provide justification for preserving wilderness areas

13.03.01.05 Explain the economic and environmental value of inland wetlands

13.03.01.05 Discuss drilling controversies

**Competency 13.04.01 Demonstrate knowledge of recycling of waste** (EMAC)

13.04.01.01 Identify landfills and available space for present and future solid waste disposal

13.04.01.02 Identify resources available through recycled solid waste management

13.04.01.03 Prepare an "Improvement Project" in the areas of controlling solid waste

**Competency 13.05.01 Identify pest-management methods** (EMOCAP)

13.05.01.01 Identify the characteristic of various pest species

13.05.01.02 Identify the goals of pest-eradication programs in the United States

13.05.01.03 Identify the impact of this nation's pest-eradication programs on the environment

13.05.01.04 Describe the various types of pesticides

13.05.01.05 Describe the pros and cons of synthetic pesticide use

13.05.01.06 Identify alternative pest-control measures

13.05.01.07 Describe the environmental impact of different types of pest-control measures

13.05.01.08 Identify the steps in the evolution of natural pesticides

13.05.01.09 Identify the strengths and weaknesses of using sex attractants, growth regulators, and sterilization to control insect pests

13.05.01.10 Identify disease-resistant cultivators

13.05.01.11 Identify pest-management techniques

13.05.01.12 Identify the components of an integrated pest-management program

13.05.01.13 Describe the pesticide applicators' license

13.05.01.15 Recognize pest damage

13.05.01.16 Identify disease organism structures

13.05.01.17 Estimate pest population numbers

**Competency 13.06.01 Assist in managing wildlife population growth and reproduction** (EMOCAP)

13.06.01.01 Identify the private, state, and federal agencies that are involved in animal wildlife conservation

13.06.01.02 Identify the species of land and aquatic wildlife common to a local area

13.06.01.03 Classify common species of land and aquatic wildlife as game, nongame, endangered, or threatened

13.06.01.04 Identify the characteristics of wildlife population dynamics

13.06.01.05 Identify established management practices for wildlife habitats

13.06.01.06 Comply with wildlife, game and fishing laws, rules, and regulations

13.06.01.07 Identify pest, insects, and diseases associated with common wildlife

13.06.01.08 Identify the characteristics of wildlife populations

**Competency 13.07.01 Identify wildlife management techniques** (R)

13.07.01.01 Identify basic reasons for wildlife management

13.07.01.02 Identify basic wildlife management practices for various game and nongame species

13.07.01.03 Identify common game and nongame species

13.07.01.04 Collect and prepare study skins of various game and non-game species

13.07.01.05 Identify different types of capture techniques

13.07.01.06 Identify basic types of equipment used in wildlife management

13.07.01.07 Identify importance of habitat development as it relates to wildlife populations

13.07.01.08 Identify advantages and disadvantages of introduction of wildlife species to new habitats

13.07.01.09 Identify different types of population control

13.07.01.10 Identify types of population density surveys

13.07.01.11 Identify importance of habitat evaluation and cover mapping

13.07.01.12 Identify carrying capacities for various species

13.07.01.13 Prepare a wildlife management plan

## ENVIRONMENTAL INDUSTRIAL TECHNOLOGY

**Competency 13.08.01 Prevention of Environmental Problems** (EMAC)

13.08.01.01 Develop contingency plan

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13.08.01.02 Review contingency plan

13.08.01.03 Identify and report potential hazards

13.08.01.04 Demonstrate how to monitor discharges and wastes

**Competency 13.08.02 Demonstrate understanding of industry** (EMAC)

13.08.02.01 Identify areas of environmental industrial technology

13.08.02.02 Identify the economic importance of the industry

13.08.02.03 Identify the environmental importance of the industry

13.08.02.04 Identify current employment opportunities

13.08.02.05 List and identify the regulatory aspects of industry

13.08.02.06 Describe the continuing-educational opportunities

13.08.02.07 List professional organizations and trade journals

13.08.02.08 Describe how to locate state licensing requirements

**Competency 13.08.03 Identify Industrial Safety and Health Requirements** (EMAC)

13.08.03.01 Understand the definition of a confined space **(I.A.W.O.S.H.A 29 C.F.R.1910.146)**

13.08.03.02 Demonstrate knowledge of occupational noise exposure **(I.A.W. O.S.H.A. 29 C.F.R. 1910.95)**

13.08.03.03 Recognize examples of heat stress in industry

13.08.03.04 Recognize example of cold stress in industry

13.08.03.05 Demonstrate key aspects of personnel decontamination

13.08.03.06 Identify types of personnel protective equipment used in the environmental field

## GENERAL WORK SAFETY

**Competency 13.09.01 Maintain safe work environment** (EMOCAP)

13.09.01.01 Comply with lab and equipment rules

13.09.01.02 Maintain clean and safe work area

13.09.01.03 Know location of safety devices (fire ext., etc)

13.09.01.04 Locate material safety data sheets

13.09.01.05 Define the purpose of MSDS

13.09.01.06 Follow safety information contained in MSDS or HMIS (Health Material Information System)

13.09.01.07 Identify the location of hazardous materials

13.09.01.08 Store hazardous materials according to manufacturer's specifications

13.09.01.09 Describe the reporting and corrective actions to be taken in a given hazardous situation

13.09.01.10 Describe the procedures for cleaning up leaks and spills

13.09.01.11 Clean up leaks and spills

13.09.01.12 Comply with responder first-aid and cardiopulmonary resuscitation certification standards. Recognize early warning signs of heart attacks and stroke. List and describe the proper techniques for artificial respiration, bleeding control, treatment of shock, and care of fractures.

13.09.01.13 Describe injury and accident reporting system

13.09.01.14 Complete accident reports

**Competency 13.09.02 Demonstrate knowledge of environmental chemistry** (EMAC)

13.09.02.01 Describe the requirements of a chemical hygiene plan **(I.A.W. O.S.HA. 1910-145)**

13.09.02.02 Identify the job functions of a Chemical Technician

13.09.02.03 Demonstrate knowledge of the chemistry of fire **(I.A.W. O.S.H.A. 29 C.F.R 1926.352 (e) and O.S.H.A. 29 C.F.R 1910.157 (g)**

**Competency 13.09.03 Demonstrate knowledge of environmental toxicology** (EMAS)

13.09.03.01 Describe Routes of entry

13.09.03.02 Explain the biological process of bioaccumulation and its effects on various populations in the environment

13.09.03.03 Distinguish between acute and chronic biological effects

13.09.03.04 Explain $LD_{50}$

13.09.03.05 Distinguish between carcinogens, mutagens, and teratogens

13.09.03.06 Outline the body's natural defenses

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13.09.03.07 Describe the process of assessing environmental toxins

13.09.03.08 Distinguish between individual and societal risks

## INDUSTRIAL POLLUTION CONTROL

**Competency 13.10.01 Demonstrate knowledge of industrial pollution control** (CSU)

13.10.01.01 List and describe disposal and management process utilized in industrial pollution control. Develop familiarity with remediation equipment technologies and other control technologies, such as pollution prevention, air pollution control devices, water treatment, and solid and hazardous waste treatment.

13.10.01.02 Identify the nature of various types of industrial pollution and some of their effects on the environment.

13.10.01.03 Understand the regulatory framework under which industrial pollutants are controlled.

13.10.01.04 Consider the general methods of air, water and solid waste pollution control.

13.10.01.05 Identify pollutants generated under some specific types of industries and their specific pollution treatment technologies.

13.10.01.06 Conduct influent/effluent analysis including fluid flow, basic piping, components, and volumetric measurements of fluids and effluents.

**Competency 13.10.02 Complete the requirements for Hazardous Materials Technician I, II, and III (OSHA 29 CFR 1910.120** (EMOCAP)

13.10.02.01 Follow the procedures identified in the emergency response plan

13.10.02.02 Use personal protective equipment (PPE) appropriate for given situation

13.10.02.03 Identify need for additional resources

13.10.02.04 Follow basic control containment and confinement procedures

13.10.02.05 Follow advanced control containment and confinement procedures

13.10.02.06 Perform assigned role in simulated emergency response situations

13.10.02.07 Function in the role of Incident Command System (ICS) Level II technician

13.10.02.08 Identify the presence of hazardous materials

13.10.02.09 Identify known and unknown hazardous materials and their classifications

13.10.02.10 Demonstrate basic hazard and risk assessment techniques

13.10.02.11 Interpret basic hazardous material terminology

13.10.02.12 Identify symptoms indicating exposure to toxic and nontoxic chemicals

13.10.02.13 Implement decontamination procedures

13.10.02.14 Develop standard operating and termination procedures

13.10.02.15 Terminate procedures

## ENVIRONMENTAL PROJECT COORDINATION

**Competency 13.11.01 Demonstrate knowledge of environmental project coordination** (CSU)

13.11.01.01 Give an overview of the management of environmental engineering projects.

13.11.01.02 Develop an appreciation of the many aspects of project coordination including problem discovery, and definition, investigative techniques, work plans, health and safety plans, agency interfacing/permit acquisition, solicitation of quotes/proposals, and other related tasks will be discussed.

13.11.01.03 Identify and explain the various components of an environmental engineering project, from start to finish.

13.11.01.04 Demonstrate knowledge of the environmental regulatory agencies' permitting processes, and communication skills needed to effectively interface with agency officials.

13.11.01.05 Identify various investigation and remediation techniques utilized in environmental engineering projects.

13.11.01.06 Identify and describe the environmental technician's role in the environmental engineering profession.

## ENVIRONMENTAL ASSESSMENT

Competency 13.12.01 Demonstrate knowledge of environmental assessment (CSU)

13.12.01.01 Develop a plan of study for the preparation of an environmental assessment/inventory of a specific site.

13.12.01.02 Develop a listing and contact various governmental agencies which may have resource information applicable to the preparation of an environmental assessment/inventory.

13.12.01.03 Organize and prepare an environmental assessment/inventory of a specific project site.

13.12.01.04 Apply environmental laws and regulations in the preparation of an environmental assessment of proposed construction project on a specific site.

13.12.01.05 Identify adverse impacts and develop a plan of mitigative measures to minimize the adverse effects resulting from the proposed project.

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## NATURE INTERPRETATION

**Competency 13.13.01 Demonstrate interpretive abilities** (R)

13.13.01.01 Follow general safety precautions

13.13.01.02 Lead nature hike for a group

13.13.01.03 Prepare an interpretative exhibit or display

13.13.01.04 Present an interpretive slide show

13.13.01.05 Present a program

13.13.01.06 Develop an interpretive publication

13.13.01.07 Lead an interpretive activity

13.13.01.08 Use computerized displays

**Competency 13.14.01 Develop interpretive skills** (R)

13.14.01.02 Use field guides and keys

13.14.01.03 Operate audiovisual equipment

13.14.01.04 Label a scientific collection

13.14.01.05 Explain folklore and history of area

13.14.01.06 Identify target audience's level of understanding.

13. 14.01.07 Identify interpretive styles

13.14.01.08 Identify interpretive tools and aids

****BIOLOGICAL SURVEYING AND MONITORING****
**Research Skills**

**Competency 13.15.01 Demonstrate Research Skills** (WR)

13.15.01.01 Students will formulate and interpret explanations for the magnitude of diversity at different periods of geologic time and present the results of investigations in a variety of forms.

13.15.01.02 Formulate and interpret explanations for the magnitude of diversity at different periods of geologic time.

13.15.01.03 Present the results of investigations in a variety of forms.

13.15.01.04 Use techniques to collect, analyze and communicate information to develop creativity, knowledge, perspective and competence to increase efficiency and encourage life long learning.

13.15.01.05 Conduct learner developed investigations independently and collaboratively over a period of weeks and months.

13.15.01.06 Scientifically catalogue and photograph scientific specimens found in freshwater and terrestrial environments and present final collection to the class.

**Competency 13.15.02 Translate information represented in the form of numbers to graphical representations, tables, charts, graphs, diagrams and geometric figures.** (WR)

13.15.02.01 Investigate dynamic equilibrium including biological, mechanical, chemical and others.

13.15.02.02 Translate information represented in the form of numbers to graphical representations, tables, charts, graphs, diagrams and geometric figures.

13.15.02.03 Answer student determined questions by designing databases and drawing inferences from information in these data bases.

13.15.02.04 Utilize field log data to collaboratively construct an ongoing databank of species abundance, climate and chronological data and infer ecological and physical relationships of terrestrial and freshwater organisms in a designated study area.

**Competency 13.15.03 Formulate models and hypothesis for models in the natural world.** (WR)

13.15.03.01 Formulate models and hypothesis for models in the scientific world.

13.15.03.02 Notice and critically analyze arguments and conclusions of investigations conducted by self.

13.15.03.03 Individually develop presentation of research project and investigations appropriate for a variety of audiences.

13.15.03.04 Seek information from a variety of sources on topics of individual scientific interest.

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**Competency 13.15.04 Keep journals of observations and inferences made over an extended period of time and reflect upon the impact of these recorded ideas on their thinking and actions.** (WR)

13.15.04.01 Coherently demonstrate various logical connections between related concepts.

13.15.04.02 Individually and collaboratively reflect on the ideas and content found in their own journal records.

13.15.04.03 Accept constructive criticism of their work.

13.15.04.04 Keep journals of observations and inferences made over an extended period of time and reflect upon the impact of these recorded ideas on their thinking and actions.

13.15.04.05 Keep a scientific journal of their observations while at the designated study area.

**Competency 13.15.05 Identify, compare, and contrast different modes of inquiry, habits of mind, attitudes and dispositions that arise in the world of science by conducting learner developed investigations independently and collaboratively over periods of weeks and months and by investigating physical and chemical changes in living and non-living systems.** (WR)

13.15.05.01 Investigate physical and chemical changes in living and non-living systems.

13.15.05.02 Identify, compare, and contrast different modes of inquiry, habits of mind, attitudes and dispositions that arise in the world of science.

13.15.05.03 Present orally (to peers, instructors, and the community ) individual investigations using multimedia equipment. Presentations will demonstrate individual and collaborative research in a particular biological and or ecological field.

**Competency 13.15.06 Create products, make inferences, and draw conclusions using databases, spreadsheets and other technologies.** (WR)

13.15.06.01 Interpret and analyze patterns and relationships in the living environment and the physical setting and communicate the results in various ways.

13.15.06.02 Seek elaboration and justification of data and ideas and reflect on alternative interpretations of the information.

13.15.06.03 Create products, make inference, and draw conclusions using databases, spreadsheets and other technologies.

13.15.06.04 Collaboratively contribute to a data base which includes a species list of species noted and in what abundances. Students will analyze species data and compare annual change describing sources of such change.

**Competency 13.15.07 Investigate patterns in nature by designing, collecting information for, and constructing databases that are useful in answering student determined questions and by formulating personal explanations and inferences using verifiable data; then present the results of investigations in a variety of forums.** (WR)

13.15.07.01 Investigate patterns in nature.

13.15.07.02 Present the results of investigations in a variety of forums.

13.15.07.03 Formulate personal explanations and inferences using verifiable data.

13.15.07.04 Students will actively collect a variety of data that will reflect territory, sex determination, behavioral characteristics, and population of a given species. This data will be entered into a database that will answer student determined questions.

**Competency 13.15.08 Fulfill responsibilities as part of a research group to recognize his or her own strengths and weakness.** (WR)

13.15.08.01 Participate in scientific debates in the classroom, and represent a position on scientific issues. Rely on documented and verified data to develop the position.

13.15.08.02 Fulfill responsibilities as part of a research group.

13.15.08.03 Recognize his or her own strengths and weakness', and develop strategies to overcome the weakness' and optimize the strengths.

**Competency 13.15.09 Learn to recognize, value and synthesize the contributions to scientific knowledge and processes from individuals of other cultures by exploring classical scientific literature that investigates principles such as biological evolution, environmental conservation, historical geology or descriptive geology.** (WR)

13.15.09.01 Explore classical scientific literature that investigates principles such as biological evolution, environmental conservation, historical geology or descriptive geology.

13.15.09.02 Translate data represented in various forms such as words, numbers, tables, charts, graphs, diagrams, maps, geometric figures, ratios, and equations.

13.15.09.03 Value the scientific thinking of others and self.

13.15.09.04 Recognize, value and synthesize the contributions to scientific knowledge and processes from individuals of other cultures.

13.15.09.05 Summarize assigned readings and prepare to discuss them in small groups. They will record the ideas and thoughts of others and critique constructively the article and its interpretation.

**Competency 13.15.10 Individually and collaboratively produce written representations of investigative results and coherently demonstrate various logical connections between related concepts by exploring the everyday nature of science within the home setting.** (WR)

13.15.10.01 Explore the structure and functions of living and non - living entities through models and simulations.

13.15.10.02 Coherently demonstrate various logical connections between related concepts.

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13.15.10.03 Individually and collaboratively produce written representations of investigative results.

13.15.10.04 Explore the everyday nature of science within the home setting and investigate technologies that define our lifestyles.

**Competency 13.15.11 Evaluate wildlife populations** (R)

13.15.11.01 Follow general safety precautions

13.15.11.02 Cruise a study area

13.15.11.03 Collect census data

13.15.11.04 Define demographics

13.15.11.05 Assess habitat

13.15.11.06 Evaluate population trends

13.15.11.07 Measure mortality

13.15.11.08 Use satellite tracking

## SCIENTIFIC METHOD

**Competency 13.15.12 Demonstrate understanding of scientific method** (COTP)

13.15.12.01 Describe the role of observation and experimentation in the development of scientific theories.

13.15.12.02 Describe the importance of the use of models in scientific thought.

13.15.12.03 Recognize that scientific models are only representations of phenomena and may in fact be faulty or deficient.

13.15.12.04 Investigate some of the ethical dilemmas of the scientist.

13.15.12.05 Demonstrate the ability to identify and define a scientific problem.

13.15.12.06 Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and field work.

13.15.12.07 Identify problems rooted in science and technology.

13.15.12.08 Demonstrate the ability to distinguish among fact, hypothesis, and opinion; the relevant from the irrelevant' and the model from the observations the model was derived to describe.

13.15.12.09 Demonstrate the ability to check the logical consistency of hypothesis with relevant laws, facts, observations, or experiments.

13.15.12.10 Ability to read scientific materials critically.

13.15.12.11 Gather scientific information through library work.

13.15.12.12 Investigate areas of specialization in science.

## RESEARCH METHODOLOGY

**Competency 13.15.13 Demonstrate understanding of research methodology** (COTP)

13.15.13.01 Apply basic scientific and technical solutions to selected problems

13.15.13.02 Demonstrate the ability to employ scientific laws and principles in familiar or unfamiliar situations.

13.15.13.03 Make predictions from data using concepts, laws, and theories.

13.15.13.04 Use facts, concepts, laws, and theories to explain phenomena.

13.15.13.05 Predict the effects of changing variables in a given situation.

13.15.13.06 Demonstrate the ability to suggest or recognize a scientific hypothesis.

13.15.13.07 Construct a hypothetical model.

13.15.13.08 Design and conduct experiments.

13.15.13.09 Make direct measurements using laboratory apparatus.

13.15.13.10 Using the chemical balance for weighing of chemical samples.

13.15.13.11 Design, conduct, and evaluate an experiment.

13.15.13.12 Use sampling techniques.

13.15.13.13 Demonstrate an ability to propose or select validating procedures.

13.15.13.14 Analyze experimental designs.

13.15.13.15 Demonstrate concern for issues related to measurement.

13.15.13.16 Demonstrate the ability to interpret data, i.e., to comprehend the meaning of data and recognize, formulate, and evaluate conclusions and generalizations on the basis of information known or given.

13.15.13.17 Draw conclusions or make inferences from data.



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13.15.13.18 Interpret information presented in pictures, drawings, charts, graphs, mathematical expressions, and scientific literature.

13.15.13.19 Demonstrate an ability to reason quantitatively and symbolically.

13.15.13.20 Interpret observations of experiments and analyze these to determine patterns, state inferences and draw conclusions.

13.15.13.21 Interpret experimental observations using facts, concepts, laws, and theories.

13.15.13.22 Communicate scientific information.

13.15.13.23 Sequence events according to the order of occurrence.

13.15.13.24 Organize and communicate the results obtained by observation and experimentation.

13.15.13.25 Describe ways scientists communicate their results.

13.15.13.26 Demonstrate the ability to summarize empirical findings clearly and concisely in written form.

## IDENTIFICATION OF FLORA AND FAUNA

**Competency 13.15.14 Identify and classify common animals species** (R)

13.15.14.01 Identify mammals and explain their life histories

13.15.14.02 Identify birds and explain their life histories

13.15.14.03 Identify reptiles and explain their life histories

13.15.14.04 Identify amphibians and explain their life histories

13.15.14.05 Identify invertebrates and explain their life histories

13.15.14.06 Identify fish and explain their life histories

**Competency 13.15.15 Identify and classify plants** (R)

13.15.15.01 Classify plants as monocots or dicots

13.15.15.02 Identify purpose of binomial nomenclature

13.15.15.03 Classify plants as annuals, biennials, or perennial

13.15.15.04 Identify environmental plant preferences

13.15.15.05 Classify plants according to growth habit

13.15.15.06 Identify plants according to scientific names

13.15.15.07 Update endangered species lists

**Competency 13.15.16 Examine plant physiology and growth** (R)

13.15.16.01 Describe woody and herbaceous plants

13.15.16.02 Identify plant parts

13.15.16.03 Identify photosynthesis process

13.15.16.04 Identify functions of roots, stems, and leaves

13.15.16.05 Identify requirements for healthy plant growth

13.15.16.06 Identify taproot and fibrous root systems

13.15.16.07 Identify differences between evergreen and deciduous plants

**Competency 13.15.17 Develop vegetation and revegetation requirements and plans** (EMOCAP)

13.15.17.01 Comply with established laws and regulations concerning vegetation and revegetation

13.15.17.02 Conduct vegetation inventories

13.15.17.03 Transplant vegetation

13.15.17.04 Establish test plots

13.15.17.05 Identify nutrient deficiencies of vegetation

13.15.17.06 Maintain revegetated areas

13.15.17.07 Prepare seedbeds

13.15.17.08 Mix seeds

13.15.17.09 Inoculate seeds

****ECOLOGICAL PRINCIPLES****

**Competency 13.16.01 Identify basic ecological principles** (R)

13.16.01.01 Identify relationship between communities of an ecosystem

13.16.01.02 Identify major plant biomes

13.16.01.03 Differentiate renewable and nonrenewable resources

13.16.01.04 Identify communities

**Competency 13.16.02 Demonstrate basic knowledge of ecosystems and ecological principles** (EMAS)

13.16.02.01 Identify the interacting spheres that make up our ecosphere

13.16.02.02 Identify the characteristics of the scientific method

13.16.02.03 Explain the rationale for comparing a controlled system against an uncontrolled system

13.16.02.04 Explain how energy flows through ecosystems

13.16.02.05 Explain how materials are cycled in ecosystems

13.16.02.06 Provide examples of the first and second laws of thermodynamics as they occur in ecosystems

13.16.02.07 Identify the steps in the photosynthesis process

13.16.02.08 Compare and contrast grazing and detritus food webs

13.16.02.09 Identify the ways in which efficiency applies to energy flow in food webs

13.16.02.10 Compare and contrast gross and net photosynthesis

13.16.02.11 Identify the steps in carbon and oxygen cycles

13.16.02.12 Explain the interrelationship of carbon and oxygen cycles

13.16.02.13 Identify the ways in which agricultural systems differ from natural ecosystems

13.16.02.14 Compare and contrast nitrogen and phosphorus cycles

13.16.02.15 Identify the ways in which humans have altered chemical cycles

13.16.02.16 Identify the characteristics of pollution

**Competency 13.16.03 Identify ecological responses to environmental change** (EMOCAP)

13.16.03.01 Identify the processes governing an organism's ability to respond to and survive

13.16.03.02 Provide examples of the law of tolerance and the law of the minimum

13.16.03.03 Identify the steps in the process of ecological succession

13.16.03.04 Provide examples of how human activities impact succession

13.16.03.05 Provide examples of types of adaptation

13.16.03.06 Identify micro-organisms used to improve our ecology

**Competency 13.16.04 Identify different classifications** (COPT)

13.16.04.01 List characteristics of living organisms.

13.16.04.02 Classify common organisms by observable characteristics.

13.16.04.03 Describe how living organisms are classified.

13.16.04.04 List characteristics of organisms in each kingdom.

13.16.04.05 Explain the difference between viruses and bacteria.

**Competency 13.16.05 Identify Environmental Interrelationships** (COPT)

13.16.05.01 Describe the interrelationship of an organism with its environment, including: pollution, populations, community, conservation, habitat, and ecosystem.

13.16.05.02 Define natural selection and list evidence for its existence.

13.16.05.03 Discuss the development of the concept of evolution.

13.16.05.04 Identify ways to take responsibility for living in a global environment.

13.16.05.05 Explain and present examples of the importance of water to sustain life in terms of available water sources, water quality, and uses and quantification.

13.16.05.06 Explain interrelationship of wastewater collection, treatment, and public health in terms of organic and inorganic pollutant concentrations and pathogenic organisms.

13.16.05.07 Describe how human activities interfere with biological diversity.

**Competency 13.16.06 Explain growth processes in natural populations** (EMOCAP)

13.16.06.01 Provide example of linear and geometric growth patterns

13.16.06.02 Explain different processes used to measure population growth

13.16.06.03 Differentiate between density-dependent and density-independent regulation of populations

13.16.06.04 Provide examples of predation and parasitism

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13.16.06.05 Identify the effects of predation, parasitism, competition, and mutualism on the regulation of the size of natural populations

13.16.06.06 Identify the physical factors controlling population sizes

13.16.06.07 Provide example of the effects of carrying capacity when a species overshoots population limits

**Competency 13.16.07 Identify human population dynamics** (EMOCAP)

13.16.07.01 Identify the factors that have influenced population growth throughout history

13.16.07.02 Identify the factors influencing population growth in recent times

13.16.07.03 Calculate population doubling time

13.16.07.04 Compare and contrast the age-structure diagrams of the United States and other countries

13.16.07.05 Identify the differences in the effects of a demographic transition on more-developed and less-developed nations

13.16.07.06 Identify the factors that are considered in calculating total fertility growth (TFG)

13.16.07.07 Identify the factors that are considered in calculating zero population growth

13.16.07.08 Explain why population growth occurs even with replacement-level fertility

## WETLAND ECOLOGY

**Competency 13.17.01 Identify and define wetlands** (WM)

13.17.01.01 Describe the history of wetlands and global wetland loss

13.17.01.02 Explain the development of wetland science and the work of wetland scientists

13.17.01.03 Provide an overview of the role of wetland managers

13.17.01.04 Identify and list the distinguishing features of wetlands

13.17.01.05 Discuss the problems associated with defining wetlands

**Competency 13.17.02 Differentiate between wetland types** (WM)

13.17.02.01 List and describe the major types of wetlands

13.17.02.02 Differentiate between the major wetlands in the United States and Canada

**Competency 13.17.03 Describe the wetland environment** (WM)

13.17.03.01 Explain the importance of hydrology in wetlands

13.17.03.02 Identify and measure important biogeochemical features of wetlands

13.17.03.03 List and observe biological adaptations to the Wetland Environment

13.17.03.04 Develop working wetland models

**Competency 13.17.04 Define and describe the major types of coastal wetland ecosystems** (WM)

13.17.04.01 Compare and contrast tidal salt marshes, tidal freshwater marshes and mangrove wetlands

**Competency 13.17.05 Define and describe the major types of inland wetland ecosystems** (WM)

13.17.05.01 Compare and contrast freshwater marshes, northern peatlands, southern deepwater swamps, and riparian wetlands

**Competency 13.17.06 Assess and practice the management of local wetlands** (WM)

13.17.06.01 Identify and quantify wetland values

13.17.06.02 Examine the legal protection of wetlands in the United States

13.17.06.03 Define restored and constructed wetlands

13.17.06.04 Observe restored and constructed wetlands

13.17.06.05 Participate in the monitoring and maintaining of wetlands

13.17.06.04 Initiate and participate in wetland inventories

**ENVIRONMENTAL POLITICS, LAWS, AND ECONOMICS**

**Competency 13.18.01 Identify past practices affecting the environment** (EMOCAP)

13.18.01.01 Locate regulatory reference materials

13.18.01.02 Access needed information using regulatory reference materials

13.18.01.03 Collect background information

13.18.01.04 Verify the accuracy of information collected

13.18.01.05 Investigate the background of each complaint

13.18.01.06 Interact with various regulatory agencies

**Competency 13.18.02 Explain the interplay of politics and economics relative to environmental problems** (EMOCAP)

13.18.02.01 Identify the environmental topics included in recently passed legislation

13.18.02.02 Identify the methods governmental agencies use to arrive at decisions affecting the environment

13.18.02.03 Identify the constituencies that politicians must take into consideration before arriving at decisions

13.18.02.04 Explain the reasons why incremental decision making prevails over holistic solutions to problems

13.18.02.05 Identify the competing interests of economists and ecologists

13.18.02.06 Identify the structures and characteristics of free, mixed, and centralized market economies

13.18.02.07 Identify the analytical tools employed by economists in decision making

13.18.02.08 Identify the differences and similarities between environmental problems in the United States and those in foreign, particularly less developed, countries

13.18.02.09 Explain how environmental issues are created and resolved by economic and/or political decisions

13.18.02.10 Identify ways in which humans are an integral part of nature

**Competency 13.18.03 Identify and classify nuclear waste** (EMAC)

13.18.03.01 Define 4 categories of nuclear waste

13.18.03.02 State method of disposal for each category of nuclear waste

13.18.03.03 Identify locations of storage for each type of nuclear waste

13.18.03.04 Identify factual information relevant to radioactivity and radiation

13.18.03.05 Name the key provisions of the Nuclear Waste Policy Act

13.18.03.06 Identify the key agencies involved in the high-level radioactive waste management program

13.18.03.07 Discuss whether this generation or future generations should provide for disposal of nuclear waste currently in storage

13.18.03.08 Explain the federal role in the management of nuclear waste

13.18.03.09 Identify problems and solutions associated with nuclear waste

13.18.03.10 Differentiate between technical and societal issues related to disposing of nuclear waste.

13.18.03.11 State ways in which people living in a democratic society make decisions about risks related to technology

13.18.03.12 Discuss risk and what can be done to reduce it in learners life

13.18.03.13 Discuss probabilities and risk assessment on an introductory level

**Competency 13.18.04 Define and describe C.E.R.C.L.A.** (EMAC)

13.18.04.01 List the key parts of C.E.R.C.L.A. site evaluation and remedy selection

13.18.04.02 Explain the 3 scores involved with the Hazard Ranking System

13.18.04.03 Identify 3 National Priority Sites

**Competency 13.18.05 Define and describe environmental legislation applicable to C.E.R.C.L.A** (EMAC)

13.18.05.01 Identify the components of C.A.A

13.18.05.02 Identify the components of C.W.A.

13.18.05.03 Identify the components of T.S.C.A.

13.18.05.04 Identify components of R.C.R.A.

**Competency 13.18.06 Identify and define job related activities to the Occupational Safety and Health Administration (O.S.H.A.)** (EMAC)

13.18.06.01 Identify hazardous waste operations and emergency response I.A.W. O.S.H.A. 29 C.F.R. 1910.120

13.18.06.02 Recognize control of hazardous energy (Lockout/Tagout) I.A.W. O.S.H.A. 29 C.F.R. 1910.147

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13.18.06.03 Identify commercial diving operations involving the environmental field I.A.W. O.S.H.A. 29 C.F.R.

13.18.06.04 Demonstrate knowledge and understanding of O.S.H.A. 29 C.F.R. 1910.1000 Z Tables

13.18.06.05 Describe O.S.H.A. requirements applicable to blood borne pathogens I.A.W. O.S.H.A. 29 C.F.R. 1910.1200


**Coalition Management**
The Ohio State University
Nancy L. Zimpher,
Executive Dean,
Sandra G. Fritz,
Project Manager
1-800-848-4815,
Ext. 4-0250

**Leadership Institute**
Wright State University
Donna S. Courtney
(937) 775-3298

**Professional Development**
University of Cincinnati
Lawrence Johnson
(513) 556-2322
Marie A. Hancy
(513) 556-2950

**Teacher Education**
**Framework**
Bowling Green State
University
Robert G. Berns
(419) 372-2904

**Workforce Development**
**Clearinghouse**
The Ohio State University
Susan Imel
(614) 292-4353,
Ext. 4-7684



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****CARTOGRAPHY****

**Competency 13.19.01 Conduct a basic survey** (EMAC)

13.19.01.01 Measure distance

13.19.01.02 Use and maintain tripod level

13.19.01.03 Read target rod

13.19.01.04 Use and interpret hand signals

13.19.01.05 Record field notes in a field log

13.19.01.06 Determine % and allowable error

13.19.01.07 Calculate acreage

13.19.01.08 Draw a field layout

13.19.01.09 Locate a bench mark

13.19.01.10 Take backsight reading

13.19.01.11 Take foresight reading

13.19.01.12 Perform bench level circuit survey

**Competency 13.19.02 Interpret topographic maps** (EMAC)

13.19.02.01 Identify legal descriptions

13.19.02.02 Identify map symbols

13.19.02.03 Interpret map legend

13.19.02.04 Determine true and magnetic north

13.19.02.05 Draw a profile using contour lines

13.19.02.06 Identify terrain type

13.19.02.07 Interpret elevation

13.19.02.07 Identify direction of water flow

13.19.02.08 Determine area

**Competency 13.19.03 Orient to field position** (EMAC)

13.19.03.01 Follow a compass course

13.19.03.02 Locate objects in the field

13.19.03.03 Orient compass to topographic maps

13.19.03.04 Adjust compass to local declination

13.19.03.05 Use back bearings

13.19.03.06 Pace out varying distances

13.19.03.07 Utilize satellite tracking


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Nancy L. Zimpher,
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1-800-848-4815,
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